Kyoto University
International Symposium

# Kyoto University International Symposium

## 1st Kyoto University - UC San Diego Joint Symposium
## New Era of Trans-Pacific Knowledge Interactions

**March 11 Wednesday and 12 Thursday, 2015**
**ANA Crowne Plaza Kyoto**




## Satellite of 1st Kyoto University - UC San Diego Joint Symposium
## FRONTIERS OF BIOMEDICAL RESEARCH IN KYOTO AND LA JOLLA

**March 13 Friday, 2015**
**Kyoto Hotel Okura**

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**Local Steering Team**

Makoto Kato-Azuma / Leader
Makoto Ikeya, Toshiro Kamiya, Tomohisa Kato, Hidenari Konoya,
Akiko Murata, Naomi Nishimura, Kana Tsuji, Sachiko Sasha Yoshioka
(Kyoto University)
Shoko Suzuki, Miwa Takayama (ISS, INC.)
Emi Miyoshi (G.T. Center Co., Ltd.)


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## FRONTIERS OF BIOMEDICAL RESEARCH IN KYOTO AND LA JOLLA

**March 13 Friday, 2015**
**Kyoto Hotel Okura**

# Welcome Message

It is my great pleasure to welcome you to Kyoto University, and to extend my personal gratitude for your participation in the 1st Kyoto University–UC San Diego Joint Symposium and its Biomedical Satellite Symposium.

As president of Kyoto University, I attach great importance to further developing our collaboration with UC San Diego. We are proud of the fact that we have maintained a healthy relationship between our two universities since UC San Diego's early years, our cooperation beginning soon after its establishment. One such early example can be found in the work Dr. Susumu Tonegawa, who, still a young graduate student at that time, moved from our Institute of Virus Research to Scripps Institution of Oceanography at UC San Diego in 1963. There, he embarked on the intensive research which would later earn him the Nobel Prize in Physiology and Medicine in 1987. According to his autobiography, as published in the Nikkei Shinbun Newspaper in 2013, UC San Diego's Administration Office treated him with remarkable kindness and generosity—perceiving him to be a good and earnest student. In fact, the office was so kind and considerate that they loaned him $300 to purchase a car!

It is a little bit surprising to me, therefore, given these warmhearted beginnings to our cooperative ties, that a formal Memorandum of Understanding (MOU) for collaboration on research and education was signed between our two institutions only very recently—in February 2014. Nevertheless, I firmly believe that the MOU and the various subsequent joint activities, such as the "Project La Jolla" joint team initiatives, that have been carried out during the past year, are paving the way for a new phase of intensive research and educational collaboration between us.

Although I do not know whether or not Dr. Tonegawa repaid the $300 he borrowed from UC San Diego (hopefully with some interest!), we are now extremely happy to welcome all of you here to Kyoto, and to Kyoto University. I could not be more pleased with the breadth and caliber of the presentations that will feature in this 1st Kyoto University–UC San Diego Joint Symposium, and in the Biomedical Satellite Symposium. I am certain that the exchange and discussions between our researchers, who are considered to be leaders in their fields, will promote the expansion and strengthening of collaboration between us.

In closing, please accept my sincere thanks once again for you participation and contribution to this symposium. I hope that you will find it to be an enlightening, beneficial, and enjoyable experience.

**Juichi Yamagiwa**
President, Kyoto University



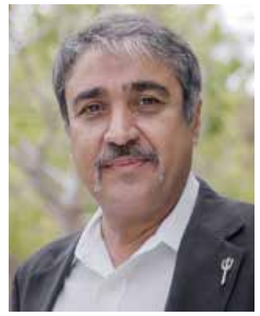
UC San Diego is pleased to partner with Kyoto University to host our first Kyoto University – UC San Diego Joint Symposium and its Biomedical Satellite Symposium. The presentations and discussions at the symposia will further strengthen the ties between our universities.

From our first partnership five decades ago, when UC San Diego was still a fledgling campus, to our recent formal signing of a Memorandum of Understanding (MOU) last year, we continue to increase our associations and build on our foundation of knowledge, innovation and interchange. The MOU will facilitate the exchange of faculty, fellows, graduate students and postdoctoral scholars, as well as publications, materials and information. We also look forward to joint research projects and publications and special short-term programs and visits.

These symposia are a mark of our teamwork and a grand addition to our existing collaborations. Over the next two days, you will hear from faculty and leaders at the forefronts of their fields. It is our hope that these meetings will educate, inspire and advance the connections between our universities.

Thank you for attending the symposia.

With kind regards



**Pradeep K. Khosla**
Chancellor, UC San Diego

# Kyoto University International Symposium

## 1st Kyoto University – UC San Diego Joint Symposium

***"New Era of Trans-Pacific Knowledge Interactions"***

**March 11 Wednesday and 12 Thursday, 2015**

**ANA Crowne Plaza Kyoto**

### Organizing Committee

Juichi Yamagiwa (President of Kyoto University, Chair)
Shoichiro Hara, Kayo Inaba, Hiroo Iwata, Shigeki Kaji, Makoto Kato-Azuma,
Yasuyuki Kono, Yasushi Kosugi, Yoshio Koyanagi, Nagahiro Minato,
Junichi Mori, Yoshinobu Takakura, Shinya Yamanaka, Sakiko Yoshikawa
(Kyoto University)
Michelle Hermas, Teri Melese, David Vera, Miwako Waga, Paul K. L. Yu
(UC San Diego)

### Program Committee

Nagahiro Minato (Executive Vice-President of Kyoto University, Chair)
Takashi Fujita, Shintaro Funahashi, Masahiro Hiraoka,
Tomohisa Kato, Makoto Kato-Azuma, Takeo Kawabata,
Eisuke Nishida, Hideo Saji, Kiyosei Takasu
(Kyoto University)
Martin Marsala, David Vera
(UC San Diego)





**Kyoto University International Symposium**
**1st Kyoto University - UC San Diego Joint Symposium**
***"New Era of Trans-Pacific Knowledge Interactions"***

## March 11 (Wednesday), 2015

| | |
|---|---|
| 8:20-9:00 | **Registration at 2F Lobby**<br>***ANA Crowne Plaza Kyoto*** |

**Room-H1 *(Heian-1)* Opening Plenary Sessions**

| | |
|---|---|
| 9:00-9:10 | **Video Movie presentation of UC San Diego**<br>**General Announcements: Makoto Kato-Azuma, Tomohisa Kato** |
| 9:10-9:50 | **Welcome and Keynote Lecture: Juichi Yamagiwa**, President of Kyoto University<br>***"Evolution of Human Sociality: What We Can Learn from Gorillas"*** |
| 9:50-10:00 | **UC San Diego Leadership Speech:**<br>**Paul K. L. Yu**, Provost, Revelle College, Former Associate Vice Chancellor for Research, UC San Diego |
| 10:00-10:40 | **Keynote Lecture: Ira S. Goodman**, Associate Director for Administration, Moores Cancer Center, UC San Diego<br>***"Creating an Effective Environment for Translational Research and Advanced Care in Cancer"*** |
| 10:40-11:30 | **Plenary Session-1:**<br>***"Connecting Global with Locals: Approaches of Interdisciplinary Field Science"***<br>Chair: **Yasuyuki Kono**, Director, Center for Southeast Asian Studies, Kyoto University<br>Chair: **Shoichiro Hara**, Director, Center for Integrated Area Studies, Kyoto University<br>***"African Studies of Kyoto University"***<br>**Shigeki Kaji**, Director, The Center for African Area Studies, Kyoto University<br>***"How can the area study collaborate with other study fields? - A successful collaboration between the area study respecting "multidisciplinary" and "glocal" concepts and a micro-scale analyses-orientated modern biomedical study -"***<br>**Mitsuaki Nishibuchi**, Center for Southeast Asian Studies, Kyoto University |
| 11:30-12:00 | **Plenary Session-2:**<br>**Plenary Lecture on Environment, Regulations, and Accreditations for Animal Experiments**<br>Chair: **Gen Kondoh**, Acting Head, Laboratory of Animal Experiments for Regeneration, Institute for Frontier Medical Sciences, Kyoto University<br>***"Components and Complexities of an In-Vivo Research Program Within the Greater Research Mission"***<br>**Philip Richter**, Campus Veterinarian, Director, Animal Care Program, Associate Clinical Professor, Pathology, UC San Diego |
| 12:00-12:30 | **Lunch at Room-H2 *(Heian-2)*** |
| 12:30-13:20 | **Room-H1 *(Heian-1)*:**<br>**Plenary Lunch-Time Seminar and Networking**<br>Chair: **Makoto Kato-Azuma**, South-West Area URA Office, Kyoto University<br>***"Bibliometric Perspectives on Competencies of Kyoto University and UC San Diego; Implications and Limitations"***<br>**Hiroshi Fukunari**, Elsevier Japan |

# Time Schedule (March 11)

| | Room-A *(Suzaku-1)* Bio-Medical, Pharmaceutical Track | Room-B *(Suzaku-2)* Chemistry, Engineering, Materials Science Track | Room-C *(Daigo)* Human Mind, Disaster Prevention, Field Science Track |
|---|---|---|---|
| 13:30-14:50 | **Session-A1:**<br>***"Innate Immunity Against Infectious Disease"***<br>Chair: **Yoshio Koyanagi**, Director, Institute for Virus Research (IVR), Kyoto University<br>**Michael Karin**, Distinguished Prof. Pharmacology, UC San Diego<br>**Takashi Fujita**, Professor, Institute for Virus Research (IVR), Kyoto University | **Session-B1:**<br>***"New Era of Organic Synthesis and Natural Compounds"***<br>Chair: **Kiyosei Takasu**, Department of Synthetic Medicinal Chemistry, Graduate School of Pharmaceutical Sciences, Kyoto University<br>**Takeo Kawabata**, Synthetic Organic Chemistry, Inst. Chemical Research, Kyoto University<br>**William Gerwick**, Scripps Institution of Oceanography, Skaggs School of Pharmacy and Pharmaceutical Sciences, UC San Diego<br>**Jun-ichi Yoshida**, Department of Synthetic Chemistry and Biological Chemistry, Graduate School of Engineering, Kyoto University | **Session-C1:**<br>***"Changing Brain"***<br>Chair: **Shintaro Funahashi**, Kokoro Research Center, Kyoto University<br>**Nicholas Spitzer**, Kavli Inst. Brain and Mind, UC San Diego<br>**Thomas Liu**, Center for Functional MRI, UC San Diego<br>**Shintaro Funahashi**, Kokoro Research Center, Kyoto University<br>**Tomoo Hirano**, Department of Biophysics, Graduate School of Science, Kyoto University |
| 14:50-16:00 | **Session-A2:**<br>***"Understanding the Mechanisms of Reprogramming to Pluripotency"***<br>Chair: **Shinji Masui**, Center for iPS Cell Research and Application (CiRA), Kyoto University<br>**Karl Willert**, Cellular and Molecular Medicine, UC San Diego<br>**Keisuke Okita**, Center for iPS Cell Research and Application (CiRA), Kyoto University | | |
| 16:00-16:20 | **Coffee Break and Networking** | **Coffee Break and Networking** | **Coffee Break and Networking** |
| 16:20-17:30 | **Session-A3:**<br>***"New Horizon in Nephrology"***<br>Chair: **Motoko Yanagita**, Department of Nephrology, Graduate School of Medicine, Kyoto University<br>**Kumar Sharma**, Department of Medicine, Director, Center for Renal Translational Medicine Institute for Metabolomic Medicine, San Diego Veterans Administration HealthCare System, UC San Diego<br>**Motoko Yanagita**, Department of Nephrology, Graduate School of Medicine,Kyoto University | | |
| 17:30-18:40 | **Session-A4:**<br>***"Molecular Genetic Approaches Toward Understanding Neurodegenerative and Cognitive Disorders"***<br>Chair: **Haruhisa Inoue**, Center for iPS Cell Research and Application (CiRA), Kyoto University<br>**Terry Gaasterland**, Computational Biology and Genomics, Director, Scripps Genome Center, UC San Diego<br>**Hiroyuki Okuno**, Medical Innovation Center, Kyoto University | | |
| 15:00-15:20 | | **Coffee Break and Networking** | **Coffee Break and Networking** |
| 15:20-16:50 | | **Session-B2:**<br>***"New Horizon in Nanoengineering"***<br>Chair: **Mitsuru Hashida**, Department of Drug Delivery Research, Graduate School of Pharmaceutical Sciences and Inst. for Integrated Cell-Material Sciences (iCeMS), Kyoto University<br>**Paul K. L. Yu**, William S.C. Chang Endowed Chair Professor at Electrical and Computer Engineering Department, and Provost of Revelle College, UC San Diego<br>**Hiroshi Imahori**, Department of Molecular Engineering, Graduate School of Engineering and Inst. for Integrated Cell-Material Sciences (iCeMS), Kyoto University | **Session-C2:**<br>***"Recent Advances in Disaster Prevention Research"***<br>Chair: **Hiroshi Kawase**, Professor and Vice Director, Disaster Management for Safe and Secure Society<br>Vice Director, Disaster Prevention Research Institute (DPRI), Kyoto University<br>**P. Benson Shing**, Vice Chair, Structural Engineering, UC San Diego<br>**Hiroshi Kawase**, DPRI, Kyoto University |
| 16:50-17:10 | | **Coffee Break and Networking** | **Coffee Break and Networking** |
| 17:10-18:40 | | **Session-B3:**<br>***"New Horizon in Materials Physics"***<br>Chair: **Yoshiteru Maeno**, Department of Physics, Graduate School of Science, Kyoto University<br>**Yuji Matsuda**, Department of Physics, Graduate School of Science, Kyoto University<br>**Benjamin White**, Brian Maple Group, Department of Physics, UC San Diego<br>**Yoshiteru Maeno**, Department of Physics, Graduate School of Science, Kyoto University | **Session-C3:**<br>***"Changing Political, Economic and Social Landscape of Southeast Asia: From Past to Present"***<br>Chair: **Pavin Chachavalpongpun**, Project Leader, Center for Southeast Asian Studies (CSEAS), Kyoto University<br>**Pavin Chachavalpongpun**, CSEAS, Kyoto University<br>**Krislert Samphantharak**, School of International Relations and Pacific Studies, UC San Diego<br>**Gianluca Bonanno**, CSEAS, Kyoto University<br>**Lisandro E. Claudio**, CSEAS, Kyoto University |
| | **Room-H3 *(Heian-3)*** | | |
| 19:00-21:00 | **Welcome Reception / Banquet**<br>**Room-H3 *(Heian-3)***<br>**dress code: casual**<br>**All the spouses and accompanying family are welcome to join us!** | | |



# Time Schedule (March 12)

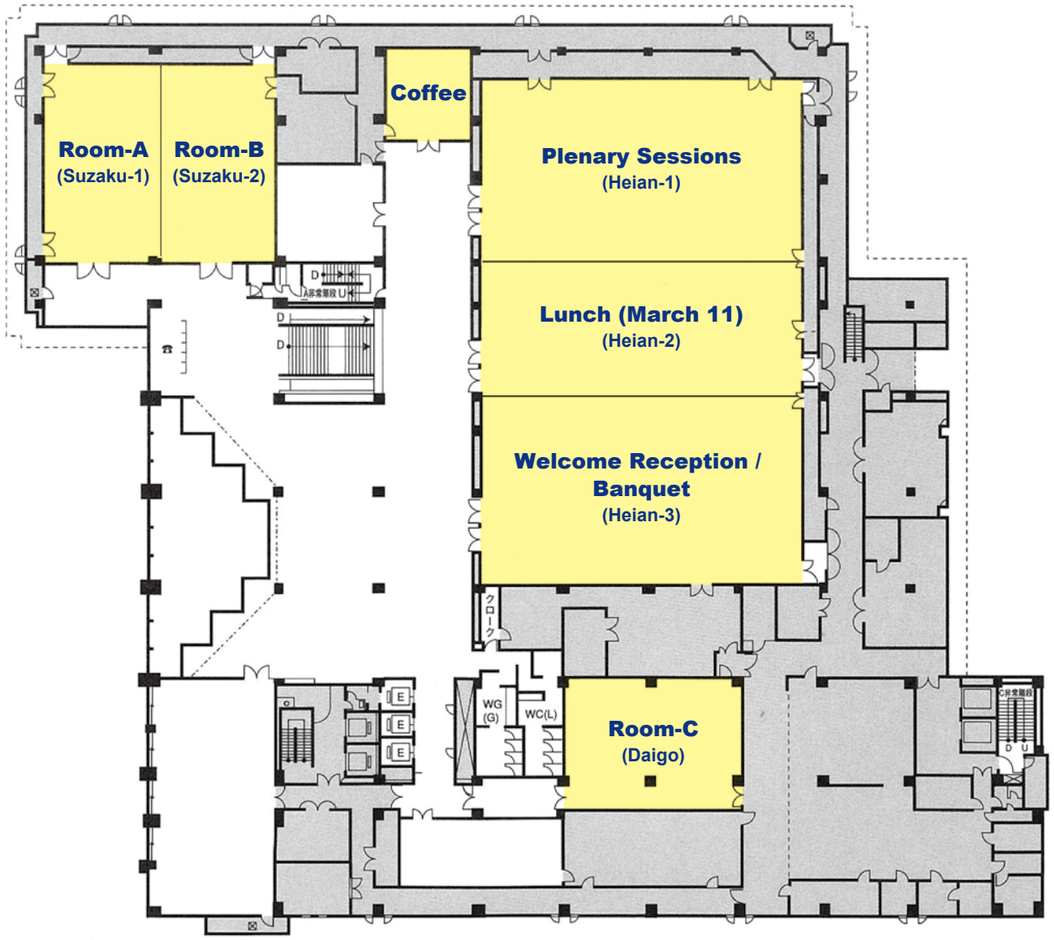
## March 12 (Thursday), 2015

| | |
|---|---|
| 8:20-9:00 | **Registration at 2F Lobby**<br>***ANA Crowne Plaza Kyoto*** |

| | Room-A *(Suzaku-1)* Bio-Medical, Pharmaceutical Track | Room-B *(Suzaku-2)* Bio-Medical, Pharmaceutical Track | Room-C *(Daigo)* Advanced Energy, Others Track |
|---|---|---|---|
| 9:10-10:10 | **Session-A5:**<br>***"Recent Advancement in Radiation Oncology"***<br>Chair: **Masahiro Hiraoka**, Department of Radiation Oncology & Image-Applied Therapy, Graduate Scholl of Medicine, Kyoto University<br>**Arno Mundt**, Department of Radiation Oncology, UC San Diego<br>**Yukinori Matsuo**, Department of Radiation Oncology & Image-Applied Therapy, Graduate Scholl of Medicine, Kyoto University | | |
| 9:10-10:20 | | **Session-A7:**<br>***"New Horizon in Gastroenterology: Bio-Medical and Bio-Engineering Approaches"***<br>Chair: **Yuzo Kodama**, Department of Gastroenterology and Hepatology, Graduate School of Medcine, Kyoto University<br>**Geert W. Schmid-Schoenbein**, Distinguished Professor and Chairman Department of Bioengineering Adjunct Professor in Medicine, UC San Diego<br>**Tomohiro Watanabe**, Department of Gastroenterology and Hepatology, Graduate School of Medcine, Kyoto University | |
| 9:30-11:00 | | | **Session-C4:**<br>***"New Horizon of Advanced Energy for Sustainable Development"***<br>Chair: **Kazunobu Nagasaki**, Professor, Institute of Advanced Energy, Graduate School of Energy Science, Kyoto University<br>**Russell Doerner**, Department of Mechanical and Aerospace, Jacobs School of Engineering, UC San Diego<br>**Kazunobu Nagasaki**, Professor, Institute of Advanced Energy, Graduate School of Energy Science, Kyoto University |
| 10:10-11:30 | **Session-A6:**<br>***"Molecular Imaging in Diagnosis and Therapy"***<br>Chair: **Hideo Saji**, Department of Patho-Functional Bioanalysis, Graduate School of Pharmaceutical Sciences, Kyoto University<br>**Masahiro Ono**, Department of Patho-Functional Bioanalysis, Graduate School of Pharmaceutical Sciences, Kyoto University<br>**Takayoshi Ishimori**, Department of Diagnostic Imaging and Nuclear Medicine, Graduate Scholl of Medicine, Kyoto University<br>**David Vera**, Department of Radiology and Surgery, Co- Director of Molecular Imaging Program, UC San Diego | | |
| 10:20-11:30 | | **Session-A8:**<br>***"New Horizon in Pharmacology and Pharmaceutical Sciences"***<br>Chair: **Yoshinobu Takakura**, Director, Graduate School of Pharmaceutical Sciences, Kyoto University<br>**Palmer Taylor**, Sandra and Monroe Trout Professor of Pharmacology Founding and Emeritus Dean Skaggs School of Pharmacy and Pharmaceutical Sciences, UC San Diego<br>**Shuji Kaneko**, Department of Molecular Pharmacology, Graduate School of Pharmaceutical Sciences, Kyoto University | |
| 11:00-11:30 | | | **Coffee Break and Networking** |
| 11:40-12:40 | **Room-A *(Suzaku-1)***<br>**Plenary Closing/Wrap-Up Panel Session:**<br>***"Next Steps towards New Era of Trans-Pacific Knowledge Interactions"***<br>Chair: **Jun-ichi Mori**, Director General, Organization for the Promotion of International Relations, Kyoto University<br>**Nagahiro Minato**, Vice President - Research, Kyoto University<br>**Yoshio Koyanagi**, Director, Institute for Virus Research, Kyoto University<br>**Carl Becker**, Kokoro Research Center, Kyoto University<br>**Paul K. L. Yu**, Provost, Revelle College, Former Associate Vice Chancellor for Research, UC San Diego<br>**David Vera**, Dept . Radiology and Surgery, Co- Director of Molecular Imaging Program, UC San Diego<br>**Michelle Hermas**, Director, International Affairs, UC San Diego | | |
| 12:40-13:40 | **Adjournment and Individual Lunch** | | |
| 13:40-18:40 | **Networking and / or Individual Free Sightseeing in Kyoto** | | |

# Floor Map (ANA Crowne Plaza Kyoto)

## 2nd Floor






# Profile (Welcome and Keynote Lecture / UC San Diego Leadership Speech / Keynote Lecture)

## Welcome and Keynote Lecture

### Juichi Yamagiwa

President, Kyoto University

**Evolution of Human Sociality: What We Can Learn from Gorillas**

## UC San Diego Leadership Speech

### Paul K. L. Yu

William S.C. Chang Endowed Chair Professor at Electrical and Computer Engineering Department, and Provost of Revelle College, UC San Diego

## Keynote Lecture

### Ira Goodman

Associate Director for Administration, Moores Cancer Center, UC San Diego

**Creating an Effective Environment for Translational Research and Advanced Care in Cancer**

This presentation will highlight the physical and organizational features of the UC San Diego Moores Cancer Center which combine to create an optimal setting for attracting translational and clinical investigators; conducting bench to bedside research; stimulating collaboration across the UC San Diego campus and the San Diego region which is rich in biomedical research organizations and biotech companies. It will discuss the integration of research and patient care across the medical school and medical center. Topics to be presented include the planning, construction and occupancy of the 270,000 sf Moores UC San Diego Cancer Center building and the creation of a UC San Diego Cancer Campus.

## Plenary Session 1

***Connecting Global with Locals: Approaches of Interdisciplinary Field Science***

Chair

### Yasuyuki Kono

Director, Professor, Center for Southeast Asian Studies, Kyoto University

Chair

### Shoichiro Hara

Director, Professor, Center for Integrated Area Studies, Kyoto University

### Shigeki Kaji

Director, Professor, The Center for African Area Studies, Kyoto University

#### African Studies of Kyoto University

Africa is far from Japan, but Japanese scholars who were in Mongolia doing fieldwork before and during World War II found the same “wind” in the Masai steppe of Tanzania as Mongolia. The altitude of mainland Tanzania is high as in Mongolia, and its ecological environments are not so different from Mongolia. In fact, arid areas stretch from the Mongolian plateau to the Masai steppe of Tanzania through Central and Southwest Asia, and pastoralists live in seamless manners.
This group of researchers was led by the biologist and anthropologist Kinji Imanishi, who gathered young researchers such as Tadao Umesao, Yoichi Wazaki, Morimichi Tomikawa, among others in a research institute in Mongolia. After the war they kept still in Japan. It is in 1958 that Imanishi went to Africa for the first time, accompanied by Juninchiro Itani. In Africa, in response to Imanishi’s academic interest to reconstruct the process of hominization, researchers spread over East Africa, some studying chimpanzees, others studying hunter-gathers, some others agriculturists, or pastoralists.
Curiously, the researchers of this first generation of African studies, who knew Mongolia, dared not go across the Great Rift Valley to reach the Congo basin. It is not until the second generation of researchers, especially Juinichiro Itani and Toshinao Yoneyama, that the Congo and other parts of Africa became in the scope of research. They were of the second generation of African studies of Kyoto University. As they did not have a nostalgic feeling of Mongolia, they easily went beyond the Great Rift Valley. Juinichiro Itani was the teacher of Juichi Yamagiwa, the president of Kyoto University, and Toshinao Yoneyama was my teacher.
Me, Yamagiwa and other researchers of the third generation of African Studies of Kyoto University are more active and do not hesitate to go anywhere. We go wherever research can be done. And all disciplines are covered by African studies in Kyoto University. Me, as a linguist, I worked in the Congo in the 70’s and 80’, in Senegal, Mali and Tanzania in the 90’s, and from 2001 I concentrate on Ugandan languages.

### Mitsuaki Nishibuchi

Professor, Center for Southeast Asian Studies, Kyoto University

#### How can the area study collaborate with other study fields? -A successful collaboration between the area study respecting “multidisciplinary ” and ”glocal” concepts and a micro-scale analyses-orientated modern biomedical study-

In general, the area study is conducted by a scholar(s) whose academic background is composed of one or more of various disciplines, aiming at elucidation of area-specific features; but, it can be complex and difficult to define. Some of the area studies may be characterized by their approach going beyond one or both of two kinds of boundaries: one between geographical areas and the other between academic disciplines. The former approach may develop into a complex study called a “glocal” study by combining the local and global concepts. The latter approach is called an “interdisciplinary” study and may develop into a maltidsciprinary study. Both approaches originate in a holistic and integrated way of thinking that many of modern sciences tend to miss due to their breakdown- or micro-scale analyses-orientated approach. Therefore, the area study respecting “multidisciplinary ” and ”glocal” concepts can collaborate with other study fields such as a micro-scale analyses-orientated modern biomedical study, and it may result in a successful complementation to each other.
I will present an successful examples of such a collaboration where a crossover approach between an area study (field investigation on diarrhea in Asia) and a bio-medical study (laboratory-based analysis of microbiological, food, and environmental samples) resulted in elucidation of an new infectious disease spreading across international borders and that the emergence and spread of the infections are influenced by various factors (cultural, socio-economic, religious, and natural-environmental factors) varying from country/area to country/area. The actual examples to be explained include discoveries of the emergence of a new clone of Vibrio parahaemolyticus O3:K6 serotype in a country in Asia and global spread of the infections by this clone; and the prevalence of Shiga toxin-producing Escherichia coli O157 in the retail beef, but scarcity of the infected patients in the developing countries in Asia.





## Plenary Session 2

***Environment, Regulations, and Accreditations for Animal Experiments***

Chair

### Gen Kondoh

Acting Head, Laboratory of Animal Experiments for Regeneration, Institute for Frontier Medical Sciences, Kyoto University

### Philip Richter

Campus Veterinarian, UC San Diego

#### Components and Complexities of an In-Vivo Research Program Within the Greater Research Mission

Known for its cutting edge research across a wide array of disciplines, UC San Diego maintains consistent research operations resulting in high impact scientific discoveries. In vivo activities comprise a critical portion of UC San Diego research efforts, regularly yielding important advances in the understanding of health and disease of humans and animals. In vivo activities are similarly critical in the teaching, training and testing arenas. A high level overview of the many facets required for maintaining UC San Diego’s highly successful in vivo research program will be presented from the perspective of the Campus Veterinarian and Director of the Animal Care Program. Program organization and responsibilities will be presented along with topics including research scope and personnel, animals, facilities and the regulatory environment. The presentation is intended to serve as a basis to compare challenges faced by Trans-Pacific partners in biomedical research, teaching and training.

## Plenary Lunch-Time Seminar and Networking

***Bibliometric Perspectives on Competencies of Kyoto University and UC San Diego; Implications and Limitations***

Chair

### Makoto Kato-Azuma

Director and Senior Research Administrator, University Research Administration (URA) Office, South-West Yoshida Main Campus, Kyoto University

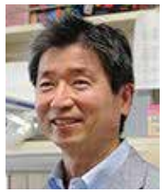
### Hiroshi Fukunari

Solution Consultant, Research Management, Elsevier

#### Bibliometric Perspectives on Competencies of Kyoto University and UC San Diego; Implications and Limitations

Elsevier, with the request from Kyoto University (Kyoto-U), has analyzed the research performances and competencies of Kyoto-U and University of California San Diego (UCSD) using bibliometric methodology, which is based on the theoretical principles and best practices developed in the field of quantitative science and technology studies, and in particular those in science and technology indicators research. Kyoto-U and UCSD have roughly the same amount of scholarly output in recent years (2008-2013), whilst UCSD has higher growth rate (CAGR are Kyoto-U:1.1%, UCSD:4.8%).
Subject areas with highest output for Kyoto-U include “Physics and Astronomy”, “Biochemistry, Genetics, and Molecular Biology”, “Medicine”, “Engineering”. Main growth in Kyoto-U’s publications came from “Physics and Astronomy” and “Medicine”.
Subject areas with highest output for UC San Diego include “Medicine”, “Biochemistry, Genetics, and Molecular Biology”, “Physics and Astronomy”, “Engineering”, “Computer Science” and “Neuroscience”. Main growth in UCSD’s publications came from “Medicine”, followed by “Biochemistry, Genetics, and Molecular Biology”.

## Session A1
***Innate Immunity Against Infectious Disease***



Chair

### Yoshio Koyanagi
Director, Professor, Institute for Virus Research (IVR), Kyoto University

### Michael Karin
Distinguished Professor of Pharmacology
Ben and Wanda Hildyard Chair for Mitochondrial and Metabolic Diseases
University of California, San Diego
American Cancer Society Research Professor

**Inflammation and Immunity in Colorectal Cancer: There is more to life and cancer than STAT3**

Inflammatory responses play pivotal roles in cancer development, including tumor initiation, promotion, progression, and metastasis. Cytokines are now recognized as important mediators linking inflammation and cancer, and are therefore potential therapeutic and preventive targets as well as prognostic factors. The interleukin (IL)-6 family of cytokines, especially IL-6 and IL-11, is highly up-regulated in many cancers and considered as one of the most important cytokine families during tumorigenesis. Here we will discuss molecular mechanisms linking the IL-6 cytokine family to solid malignancies and their treatment.

### Takashi Fujita
Professor, Institute for Virus Research (IVR), Kyoto University

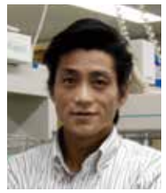
**Dysregulation of MDA5-dependent signaling causes autoimmune disorder**

MDA5 is an essential intracellular sensor for several viruses, including picornaviruses, and elicits antiviral interferon (IFN) responses by recognizing viral dsRNAs. Once MDA5 senses replicating viruses, it triggers signal to activate antiviral genes including those of type I and III IFN. Activation of IFN system is critical as antiviral innate immunity and promotes activation of acquired immunity. These immune responses orchestrate eradication of infecting viruses.
On the other hand, MDA5 has been implicated in autoimmunity. The mechanisms of how MDA5 contribute to autoimmunity remain unclear. Here we provide direct evidence that dysregulation of MDA5 caused autoimmune disorders. We established a mutant mouse line bearing MDA5 mutation by ENU mutagenesis, which spontaneously developed lupus-like autoimmune symptoms without viral infection. Inflammation was dependent on an adaptor molecule, IPS-1, indicating the importance of MDA5-signaling. In addition, intercrossing the mutant mice with type I IFN receptor-deficient mice ameliorated clinical manifestations. This MDA5 mutant could activate signaling in the absence of its ligand, but was paradoxically defective for ligand- and virus-induced signaling, suggesting that the mutation induces a conformational change in MDA5. These findings provide insight into the association between disorders of the innate immune system and autoimmunity.





## Session A2
***Understanding the Mechanisms of Reprogramming to Pluripotency***



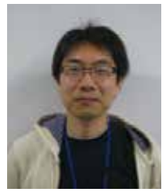
Chair

### Shinji Masui
Lecturer
Department of Reprogramming Science
Center for iPS Cell Research and Application (CiRA)
Kyoto University

### Karl Willert
Assistant Professor, Cellular & Molecular Medicine
Director, Human Embryonic Stem Cell Core Facility, Stem Cell Program
Sanford Consortium for Regenerative Medicine
University of California, San Diego

**Making heads or tails of WNT signaling in stem cells and cancer**

Underlying my research interests has been the study of WNT proteins, a family of secreted growth factors that regulate embryonic development and tissue homeostasis and impact a large number of human diseases, including neurodegeneration and cancer. In 2003, we showed that WNT proteins are lipid modified and exert potent effects on hematopoietic stem cells. We have extended these studies to human pluripotent stem cells and demonstrated that low levels of WNT signaling are required for stem cell self renewal whereas high levels of WNT signaling promote differentiation. Using mutations in PORCN, which encodes an essential WNT processing enzyme, we showed that WNT signaling is required for reprogramming of fibroblasts to an induced pluripotent state. Our ongoing research is exploring novel mechanisms by which WNT signal potency is regulated and potential links between aberrant WNT signaling and aneuploidy and consequently cancer. In addition, using zebrafish, we are investigating the essential role of WNT signaling in hematopoietic stem cell development. These studies will instruct in vitro differentiation protocols to derive hematopoietic stem cells from pluripotent stem cells.



### Keisuke Okita
Lecturer
Department of Reprogramming Science
Center for iPS Cell Research and Application (CiRA)
Kyoto University

**Approach of iPS cells to medical application**

Reprogramming of somatic cells into pluripotent stem cells has been reported by introducing a combination of several genes, such as Oct3/4, Sox2, Klf4, and c-Myc. The induced pluripotent stem (iPS) cells from patient's somatic cells would be useful source for disease modeling, drug discovery and cell transplantation therapies. Various methods of iPS cell generation have been developed in order to improve the efficiency of reprogramming, the quality, and the safety of iPS cells. Factors that affect the generation of iPS cells can be grouped into four categories; (a) type of original somatic cells, (b) culture conditions, (c) combination of reprogramming genes, and (d) method to transduce those genes into cells. It is important to choose the appropriate method based on the purpose of iPS cell generation; basic research or clinical application. Most human iPS cells were made by retro/lentivirus vectors, which integrate the reprogramming genes into host genomes and may increase tumor formation risk. In fact, activation of c-Myc transgene resulted in tumor formation in mouse model. We have reported the efficient generation of human iPSCs from adult fibroblasts and blood cells using a combination of plasmids. Still this method should be inspected from a regulative point of view to guarantee their safeness, it would be a one possible approach to make iPS cells for clinical application. I'd like to discuss the progress and challenges for the application of iPS cells into clinical field.

## Session A3
*New Horizon in Nephrology*

Chair

# Motoko Yanagita

Professor, Department of Nephrology, Graduate School of Medicine, Kyoto University

### Mechanisms and prevention of renal fibrosis

Renal fibrosis is a major hallmark of chronic kidney disease (CKD). The degree of tubulointerstitial fibrosis correlates with the decline of renal function and is a reliable predictor of renal prognosis. Therapeutic strategies to halt the progression of fibrosis are expected to retard the decline of renal function. Since 1970s, the origins and the roles of scar-producing myofibroblasts in renal fibrosis have been intensively investigated. Determining the origins is important because the origins might account for the heterogeneous characteristics and behaviors of myofibroblasts. We employed a genetic lineage tracing method to demonstrate that resident fibroblasts including erythropoietin (EPO) producing cells in healthy kidneys are the source of myofibroblasts during fibrosis, and that the transdifferentiation from resident fibroblast to myofibroblasts decreases the EPO-producing capacity of these cells, leading to renal anemia and renal fibrosis. We also demonstrated that renal anemia and renal fibrosis could be reversed by the administration of selective estrogen receptor modulator (SERM). These findings highlight a potential therapeutic approach for anemia and fibrosis associated with chronic kidney disease.
Next we employed a novel genetic model to cause severe proximal tubule injury, a hallmark of acute kidney injury (AKI), and showed that proximal tubule injury triggers the transdifferentiation of fibroblasts to myofibroblasts, resulting in fibrosis and renal anemia. These data might explain, at least in part, the mechanism of AKI to CKD continuum.
In this presentation, I will further discuss the impact of fibrosis on tubular regeneration, and possible therapeutic approach against fibrosis.

# Kumar Sharma

Professor of Medicine, UC San Diego; Director, Institute of Metabolomic Medicine; Director, Center for Renal Translational Medicine, UC San Diego

### Mitochondrial Hormesis and Diabetic Kidney Disease

The concept that superoxide production from mitochondria and excess reactive oxygen species production as a driving, unifying theory to understand diabetic complications has been tightly held for the past decade. However, the results of several anti-oxidant based trials have been negative and in some cases have led to increased morbidity and mortality. In the present review, an alternative concept will be presented as a possible central player in understanding diabetic complications, i.e. mitochondrial hormesis. In the perspective of mitohochondrial hormesis, the production of mitochondrial superoxide is a sign of healthy, well functioning mitochondria and reflects oxidative phosphorylation. Imaging studies to evaluate superoxide levels in organs in real time revealed that the normal kidney has a robust degree of superoxide production. Surprisingly, the kidneys from several models of diabetes have a marked reduction of renal superoxide levels in live animals. The reduced superoxide production was associated with reduced activity of the electron chain complex and reduced mitochondrial biogenesis. The basis for reduction of reduced renal superoxide production, mitochondrial electron chain complex activity and mitochondrial biogenesis appears to be due to reduction of the master energy sensor, AMPK. Stimulation of AMPK led to an increase in renal superoxide, complex activity and mitochondrial biogenesis. The increased superoxide levels was associated with a reduction of inflammation and matrix accumulation. A similar process appears to be present in the diabetic heart and possibly in diabetic neuropathy. The reduction of mitochondrial function appears to also be prominent in patients with diabetic kidney disease as a panel of urine metabolites that are produced by mitochondria are significantly reduced. Similar to the diabetic mouse kidney, there is a reduction of mitochondrial protein in the human diabetic kidney and a reduction of AMPK and PGC1a. PGC1a regulation has recently been found to be a critical component of many types of chronic and acute kidney diseases. Several novel therapeutic agents provide renoprotection and are able to stimulate PGC1a, mitochondrial biogenesis and increase urinary levels of the metabolomic panel of diabetic kidney disease. The concept of mitochondrial hormesis is consistent with data demonstrating that reduction of oxidant production is deleterious in several species and in humans. Mitochondrial hormesis also suggests that approaches to enhance mitochondrial function via activators of AMPK and PGC1a from exercise, caloric restriction, or medications will result in stimulation of mitochondrial superoxide production and promote organ healing.





## Session A4
*Molecular Genetic Approaches Toward Understanding Neurodegenerative and Cognitive Disorders*

Chair

# Haruhisa Inoue

Professor
Laboratory of Stem Cell Medicine
Department of Cell Growth and Differentiation
Center for iPS Cell Research and Application (CiRA)
Kyoto University

# Terry Gaasterland

Professor of Computational Biology and Genomics
Director, Scripps Genome Center
Member, Institute for Genomic Medicine
University of California, San Diego and Scripps Institution of Oceanography

### Integrating exome sequencing, mRNA-seq, and microRNA-seq to identify genes and mechanisms in optic nerve degeneration

In glaucoma, progressive optic nerve degeneration can lead to irreversible vision impairment and eventual blindness, despite treatment. Genetic causes and influences are not yet clear in primary open angle glaucoma (POAG), the most prevalent form of the disease in North America, Europe, and several other parts of the world. The genetics of POAG are complex; to date, no single causative genomic variant has been established as causing the disease.
Genome-wide sequencing of exons from protein coding and non-coding genes in 333 patients with primary open angle glaucoma revealed over 100 associated SNP sites in over 70 genes. To rank and prioritize genes and generate hypotheses about molecular mechanisms disrupted by associated variant sites, mRNA and small RNA (microRNA) were sequenced from ocular tissues relevant to the disease.
Analysis protocols and techniques for integrated data interpretation to construct putative regulatory networks underlying disease will be discussed. The approach revealed two strong candidate models explaining neurodegeneration in POAG. Data collection and analysis methods are generally applicable beyond glaucoma to other chronic, progressive diseases associated with aging.

# Hiroyuki Okuno

Associate Professor
Medical Innovation Center, Graduate School of Medicine, Kyoto University

### Role of the neuronal immediate-early gene Arc in synaptic and cognitive functions

The cognitive activity including learning and memory formation, which likely rely on changes in information processing within neuronal circuits, involves activity-dependent gene expression in the brain. Immediate-early genes (IEGs), a class of genes that are rapidly and transiently up-regulated by extracellular stimuli, are dynamically regulated by neuronal activity under physiological conditions. *Arc* (also known as *Arg*3.1) is one of the most responsive neuronal IEGs and its induction is tightly coupled with cognitive information processing in the brain. *Arc* is implicated in AMPA-type glutamate receptor (AMPA-R) trafficking, synaptic plasticity, experience-dependent cortical reorganization, as well as long-term memory formation (Okuno, 2011). We previously reported a preferred targeting of Arc protein to inactive synapses (Okuno et al., 2012). The degree of synaptic Arc accumulation was more prominent during a period of inactivity following strong induction, and correlated with removal of surface AMPA-Rs from individual synapses. Furthermore, our follow-up studies have revealed that lack of *Arc in vivo* caused cognitive impairments in several behavioral tasks. Taken together, our findings suggest that the plasticity-related gene *Arc* plays a critical role in regulation of surface AMPA-R at individual synapses, which could be the fundamental molecular basis underlying cognitive functions in the brain.

References:
Okuno, H., et al. Inverse synaptic tagging of inactive synapses via dynamic interaction of Arc/Arg3.1 with CaMKII*β*. *Cell*, 149:886-898, (2012).
Okuno, H. Regulation and function of immediate-early genes in the brain: beyond neuronal activity markers. *Neuroscience Res*. 69:175-186, (2011).

## Session B1
*New Era of Organic Synthesis and Natural Compounds*

Chair

### Kiyosei Takasu
Professor, Department of Synthetic Medicinal Chemistry, Graduate School of Pharmaceutical Sciences, Kyoto University

### Takeo Kawabata
Professor, Institute for Chemical Research, Kyoto University

#### Site-Selective Catalysis
Selectivity in organic synthesis includes chemoselectivity, diastereoselectivity, enantioselectvity, and site-selectivity (regioselectivity). The former three have been well established. Especially, asymmetric synthesis concerning enantioselectivity has been extensively developed in the last few decades. On the other hand, site-selective catalysis is an emerging area in current organic synthesis. We describe here our recent efforts in site-selective catalysis.
Selecting one of the two enantiofaces has been the central theme in the studies on asymmetric synthesis. Steric repulsive interaction is a powerful principle to achieve this purpose. On the other hand, steric repulsive interaction is no longer effective for site-selective catalysis, where selecting one reacting site out of many other potential reacting sites is required. We have developed an organocatalytic method for site-selective acylation of carbohydrates with multiple hydroxy groups based on the strategy for site-selective activation. Short-step total synthesis of natural glycosides via the site-selective functionalization of glucose will be discussed. The related organocatalysts were found effective for site-selective cleavage of the peptides with specific sequence under neutral conditions at ambient temperature, and asymmetric synthesis of topologically chiral rotaxenes. These conventionally difficult organic transformations were achieved via the fine molecular recognition of the substrate structure by the pertinent catalyst.

### William Gerwick
Distinguished Professor of Oceanography and Pharmaceutical Sciences

#### Interdisciplinary Approaches to Marine Natural Products Drug Discovery
The unique organisms living in the world's oceans are an increasingly inspiring source of new drug leads, especially in the areas of cancer, inflammation and the neurosciences. To date, some 13 drugs of marine derivation or inspiration have reached the clinic in the US, Europe or Asia, and many more are on the horizon. These include agents for the treatment of cancer, pain, viral diseases and hyperlipidemia, as well as marine derived proteins involved in vaccines and diabetes treatments. Our research program focuses on drug discovery from marine cyanobacteria and algae, both of which are extraordinarily rich in structurally diverse natural products. We are exploring the integrated use of several different technologies, such as genome sequencing, mass spectrometry-based Molecular Networks, and synthetic medicinal chemistry, to innovatively discover and develop new drug leads from these marine organisms. One recent project has involved our discovery of a new class of proteasome inhibitor from a marine cyanobacterium and our ensuing efforts to synthesize analogs with improved pharmaceutical properties and potency. Another project to be discussed derives from a new approach in which we are integrating genomic and metabolomics information to identify structurally novel and biologically potent metabolites. This latter work identified a novel series of chlorinated acyl amides that have potent binding properties to cannabinoid receptors, and thus may be useful in the treatment of pain and cognitive disorders. Summarizing, the marine environment is a rich source of structurally unique small molecules that can be used as initial leads in drug discovery programs, and by integrating several different and contemporary approaches, we are opening new vistas in natural products science.

### Jun-ichi Yoshida
Professor, Department of Synthetic Chemistry and Biological Chemistry, Graduate School of Engineering, Kyoto University

#### Flash Chemistry: Departure from Flask Chemistry
Most of chemical reactions for synthesis have been performed in batch type reactors such as flasks. Recently, it became possible, however, to conduct chemical reactions in flow type reactors. There are several advantages of continuous flow synthesis in comparison with batch synthesis. For example, flow processes are generally more suitable for automation than batch processes. Flow synthesis enables the use of hazardous chemicals safely. Dangerous reactions can be done in a controlled way under continuous flow mode. However, there is another important feature of flow chemistry. Flow chemistry enables reactions that cannot be done in batch, opening a new possibility of chemical synthesis. In this presentation we focus on the development of such a field of flow chemistry, in particular flash chemistry. Flash chemistry offers an integrated flow scheme for extremely fast reactions involving highly reactive unstable species on a preparative scale on time scales of a second or less, which cannot be achieved by flask chemistry. The principle of flash chemistry and its applications to synthesis of biologically interesting molecules will be presented.





## Session B2
*New Horizon in Nanoengineering*

Chair

### Mitsuru Hashida
Professor, Department of Drug Delivery Research, Graduate School of Pharmaceutical Sciences and Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University

### Paul K. L. Yu
William S.C. Chang Endowed Chair Professor at Electrical and Computer Engineering Department, and Provost of Revelle College, UC San Diego

#### Green Campus and Nanotechnology
We present an overview of the semiconductor nanotechnology research for renewable energy generation, and their implications for a variety of campus wide "Green Technology" projects at the University of California, San Diego. The on-going campus projects aim at higher energy saving and improving efficiency such as green building design, solar massive biofuel investigation using algae, photovoltaics and solar forecasting. The research projects emphasize long term and cost effective approaches which bring together research teams, including engineers, scientists, and facility staff, to tackle new concepts and their realizations. Novel photovoltaic and photo-electrochemical cells research based on various semiconductor nanostructures, specifically compound semiconductor quantum wells and nanowires, and the use of plasmonics and nanoparticles to increase efficiency of optical absorption, are among the examples. Technology challenges for the integration of different components can emerge as a new paradigm for cross-campus, multi-university research initiative.

### Hiroshi Imahori
Professor, Department of Molecular Engineering, Graduate School of Engineering and Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University

#### Photofunctional Nanomaterials for Energy and Biological Applications
The integration of chemistry and biology has paved the way for new interdisciplinary science and technology that enable the control and manipulation of functions of biological systems. This methodology has been extended to explore the fusion between tailored nanomaterials and biological systems as well as protein machines and artificial systems. In this talk I will show our recent attempts to integrate materials chemsitry and cell biology.
First, we focus on nanoscale electric field of a photogenerated charge-separated state of a donor-acceptor linked molecule. If this charge separation (CS) molecule can be delivered to biological membrane and then the charge-separated state is generated by photoinduced electron transfer (ET), the extremely large electric field (~$10^6$ V $cm^{-1}$) will affect membrane potential (~$10^5$ V $cm^{-1}$) and/or voltage-gated ion channel, resulting in the switching of ion transport across the membrane. We designed ferrocene (Fc)-porphyrin (P)-$C_{60}$ linked triads as a CS molecule. Delivery of the CS molecules to the plasma membrane of PC12 cells and subsequent light irradiation led to the depolarization in the membrane potential as well as the inhibition of potassium ion flow across the membrane. We also found the close correlation between the CS lifetime and the degree of depolarization.
Secondly, Semiconducting and metallic single-walled carbon nanotubes (s-SWNTs and m-SWNTs) were enriched by agarose gel chromatography and their photothermal and photodynamic effects were examined in $H_2O$. Under near-infrared laser irradiation, s-SWNTs generated reactive oxygen species (ROS) more than m-SWNTs, whereas m-SWNTs produced heat more efficiently than s-SWNTs. More importantly, cancer cell killing by PDE of s-SWNTs has been disclosed for the first time. Our study provides fundamental insights for developing SWNT-based cancer therapies. I will present the details together with our background on artificial photosynthesis and solar energy conversion.

## Session B3
*New Horizon in Materials Physics*

Chair

### Yoshiteru Maeno

Professor, Department of Physics, Graduate School of Science, Kyoto University

#### Topological Superconductivity and "Superspintronics"

Insulator inside but good metallic state carrying dissipation-less spin current on the surface: such attractive material was predicted in 2007 and first demonstrated in 2009. This material has been coined a "topological insulator" because this property originates from topological phase winding of the electronic wave function in the momentum space. Actually, similar behavior was previously known as a separate phenomenon in two-dimensional insulators, especially under magnetic fields, or in superconductors. However, triggered by the recent research progress establishing such "topological insulators", the common perspective of topological classification of materials has been expanded to cover a vast range of materials. Furthermore, this viewpoint provides new insights into investigations of novel "topological quantum phenomena" in insulators, superconductors, superfluids, etc. and considered as one of the most active subjects of the materials physics.
In this talk, we focus on the topological superconducting phenomena in a layered oxide $Sr_2RuO_4$, a leading candidate of the spin-triplet, "*p+ip*" chiral superconductor. The superconductivity of this oxide was discovered by our group 20 years ago. After introducing recent results strengthening the evidence for spin-triplet pairing, we describe two topics regarding its topological superconducting phenomena.
First, we describe the evidence of half-quantum fluxoid (HQF) states observed in the magnetization of micron-size rings of single-crystalline $Sr_2RuO_4$. We also introduce our recent efforts toward confirming the HQF states by Little-Parks resistance oscillations in micro-rings.
Second, we introduce our studies of a hybrid system consisting of thin film of ferromagnetic $SrRuO_3$ deposited on the cleaved surface of $Sr_2RuO_4$. This system is expected to form a ferromagnetic-metal/ triplet-superconductor (FM/TSC) junction with unusually strong penetration of superconductivity into the ferromagnet. Since a spin current of superconducting pairs are predicted to emerge in this system, controlling such current may leads to a device for "superspintronics".

### Benjamin White

Postdoctoral Researcher, Brian Maple Lab., Department of Physics, UC San Diego

#### Quantum criticality and unconventional superconductivity in heavy-fermion materials

The low-temperature physical properties of a simple metal such as copper can be understood using models that ignore interactions between conduction electrons. When this condition is not satisfied in more complex materials, Fermi liquid theory is applied in which conduction electrons and their interactions are redefined as non-interacting quasiparticles with renormalized masses. In the case of so-called "heavy-fermion" compounds, a lattice of local magnetic moments is immersed in a sea of conduction electrons which undergoes the Kondo effect at each site, leading to the formation of quasiparticles of order 1000 times heavier than a free electron. Numerous distinct and nearly degenerate ground states are often encountered within a single heavy-fermion compound. These intrinsic instabilities can be exploited in the laboratory by applying magnetic field or pressure, or by modifying the chemical composition to tune materials between distinct ground states. This fertile environment leads to rich phase spaces wherein the interplay between competing ground states, often manifested by strong quantum fluctuations at low temperature, supports emergent phenomena near the boundary where one ground state is destroyed and another is stabilized. This includes non-Fermi liquid behavior of the physical properties and the emergence of unconventional superconductivity wherein pairing of the massive quasiparticles is generally believed to be mediated by magnetic or, in a few cases, quadrupolar fluctuations. In this talk, the rich subject of heavy-fermion physics will be introduced, emphasizing the development of the field and a materials-driven approach to research. This introduction sets the stage for a survey of recent studies that have explored the evolution and interplay of unconventional superconductivity, electronic structure, and quantum criticality in the superconducting heavy-fermion system $Ce_{1-x}Yb_xCoIn_5$. This discussion will include intriguing new evidence from measurements of the London penetration depth for a change from nodal to nodeless superconductivity that is concomitant with a reconstruction of the Fermi surface topology.

### Yuji Matsuda

Professor, Department of Physics, Graduate School of Science, Kyoto University

#### BCS-BEC crossover in iron-based superconductors

The quest for the understanding of exotic superconductivity has been at the forefront of condensed matter physics. The superconductivity in most metals is well explained by the weak coupling Bardeen-Cooper-Schrieffer (BCS) theory, which describes the pairing instability arising from a weak attractive interaction in a highly degenerate system of fermion. The opposite limit is Bose-Einstein condensation (BEC) where composite bosons consisting of strongly coupled fermions condense into a single coherent ground state. These two limiting situations can be connected with continuity throughout the crossover. In conventional superconductors in the BCS limit, the superconducting transition temperature Tc is usually several orders of magnitude smaller than Fermi temperature $T_F$, $T_c/T_F=10^{-5}$-$10^{-4}$, while in the BEC limit $T_c$ is of the order of $T_F$.
Of particular interest is the BCS-BEC crossover regime with intermediate value of the coupling, where the strongly interacting pairs with size comparable to the inverse Fermi momentum - unitary Fermi gas- appear. This crossover bridges the two important theories of bound particles in a unified picture with the ratio of the attractive interaction to the Fermi energy as a tuning parameter. Here, we show that the Fermi energy of FeSe is extremely small, resulting in that this system can be regarded as an extraordinary "high-temperature" superconductor located at the verge of a BCS-BEC crossover. Most importantly, we discover the emergence of an unexpected superconducting phase in strong magnetic fields, demonstrating that the Zeeman splitting comparable to the Fermi energy leads to a strong modification of the properties The BCS-BEC cross-over bridges the two important theories of bound particles in a unified picture with the ratio of the attractive interaction to the Fermi energy as a tuning parameter.





## Session C1
*Changing Brain*

Chair

### Shintaro Funahashi

Professor, Kokoro Research Center, Kyoto University

#### Flexible allocation of cognitive capacity during dual-task performances

Simultaneous performance of two different tasks often leads to performance deficits in the component tasks. This effect is known as dual-task interference. This interference effect is thought to be a proof of the flexible allocation of capacity-limited cognitive resources in a variety of cognitive processes. Recent studies indicate that the lateral prefrontal cortex (LPFC) is the putative neural substrate for such allocation mechanism. To understand the contribution of LPFC to dual-task interference, we recorded single-neuron activities in LPFC while two monkeys performed dual-tasks that required the simultaneous performance of a load-varying spatial attention task and a spatial memory task, both of which require intact functioning of LPFC. Behavioral studies showed that monkeys exhibited dual-task interference, such that the performance of the memory task was disturbed in proportion as the difficulty of the attention task. In addition, LPFC neurons showed a decreased ability to hold task-relevant mnemonic information to a degree proportional to the increased demand of the concurrently performing attention task. The locus of the interference was identified to reside in the simultaneous and overloaded recruitment of the same LPFC population by both memory and attention tasks. These results provide neurophysiological evidence for psychological models of dual-task interference and capacity limitation. These results also provide neurophysiological evidences for flexible allocation of capacity-limited cognitive resources depending on the demand of information processes.

### Nick Spitzer

Distinguished Professor and Director, Kavli Institute for Brain and Mind, UC San Diego

#### Neurotransmitter Switching in the Adult Brain

The brain changes in response to changes in the environment and experience, and these changes underlie processes such as learning and memory. Substantial evidence demonstrates that this brain plasticity results from changes in the strength and number of synapses – the connections that neurons make. But is there more to it than that? The neurotransmitters made by neurons, which they use to signal to one another, have long been thought to be fixed and unchanging, and to be part of neuronal identity. Transmitter switching – substituting one neurotransmitter for another – is a relatively newly recognized form of plasticity. It occurs both during development and in the mature brain, it regulates behavior, and it may provide a basis for treating neurological disorders. We have visualized transmitter switching in single neurons in the adult brain and begun to understand the signaling cascade by which transmitter switching is achieved in the embryonic nervous system. These findings raise questions about the flexibility of the connectome and the involvement of transmitter switching in neurological disorders.

### Thomas Liu

Professor of Radiology and Bioengineering, UC San Diego; Director, UC San Diego Center for Funtional MRI

#### Multimodal Imaging of Resting State Brain Activity

Even when not engaged in an explicit task, the brain exhibits a rich and complex repertoire of dynamic activity. Spontaneous fluctuations in brain activity that are observed in the resting state show a remarkable degree of functional organization, as evidenced by correlations between the fluctuations observed across different brain regions. It is this structure in the spontaneous fluctuations that underlies current efforts to map the human brain connectome. Still, there is much that is unknown about the origin and characteristics of resting-state brain fluctuations. We are using multimodal imaging methods to investigate the mechanisms of resting-state brain activity. These studies have led to a better understanding of the relation between fMRI, EEG, and MEG measures of brain connectivity and have uncovered a link between global patterns of resting-state brain activity and states of vigilance.

### Tomoo Hirano

Professor, Department of Biophysics, Graduate School of Science, Kyoto University

#### Molecular mechanisms and roles of synaptic plasticity

Synaptic plasticity is activity-dependent modulation of transmission efficacy at synapses. It is a cellular basis of learning and memory, and is implicated in neuronal and mental disorders and addiction. In this presentation I would like to talk about two topics about synaptic plasticity, molecular mechanisms and functional roles.
Synaptic plasticity can be expressed either in presynaptic terminals or in the postsynaptic membrane. The increase or decrease in the number of neuro-transmitter receptors has been considered as a major alteration in the postsynaptic membrane during synaptic plasticity. As the first topic, I will present our recent data about how AMPA-type glutamate receptors (AMPARs) dynamically change during synaptic plasticity. In the hippocampal long-term potentiation or long-term depression (LTD) the number of AMPARs increases or decreases at the postsynaptic membrane, respectively. Such changes in the AMPAR number are caused by changes of exocytosis and endocytosis of AMPARs. We have developed novel experimental methods to visualize AMPARs tagged with a fluorescent protein around the postsynaptic membrane at a high signal to noise ratio. Using the methods we could record individual exocytosis and endocytosis of AMPARs, and found that they actually change during LTP and LTD.
We have been also studying roles of cerebellar synaptic plasticity in the motor learning. LTD at excitatory glutamatergic synapses on Purkinje cells has been considered to be the main mechanism for cerebellar motor learning. However, this idea has been challenged. I will explain our recent finding that LTP at inhibitory synapses on a Purkinje cell also contributes adaptation of vestibulo-ocular reflex, a model paradigm of motor learning.

## Session C2

***Recent Advances in Disaster Prevention Research***

Chair

### Hiroshi Kawase

Professor and Vice Director, Disaster Prevention Research Institute (DPRI), Kyoto University

**Strong motion characteristics of inland earthquakes and subsequent hazard mitigation**

Twenty years have passed since 1995 Hyogo-ken Nanbu (Kobe) earthquake and four years have passed since 2011 Tohoku earthquake. The emerged aspects of disaster in these two events were significantly different in terms of earthquake engineering and subsequent disaster mitigation. The former yielded 100,000 houses collapsed or heavily damaged and so 90% of 6,434 casualties were due to immediate consequence of building damage and subsequent fire, while the latter had associated with a huge height of tsunami and so 99% of 16,384 casualties were due to immediate consequence of tsunami and subsequent fire. Immediately after the Kobe earthquake we started to estimate strong ground motions in and around Kobe by using a heterogeneous rupture process and a three-dimensional basin structure. We found that the real cause of the concentrated building damage was caused by the interaction of a heterogeneous fault rupture with the so-called “basin edge effect”. The fault rupture included four or five small asperities each of which generated a velocity pulse of 1 to 2 second in predominant period. The resultant ground motions had high peak acceleration about 1g and high peak velocity about 1.5m/s. Later these ground motion features are proved to be very common for inland earthquakes beneath the sedimentary basin, although no countries, including Japan, have considered such ground motions in their building code yet. To prevent damage in building, especially in wooden houses, we need to give structures strong horizontal “deformability”, much stronger than previously thought. In this presentation we will show results of on-going research for a new wooden devise as a countermeasure of damage called “Wall-of-Column”, which has a strong sustainability even after the maximum story drift of 1/8.

### Benson Shing

Professor, Department of Strucutral Engineering, UC San Diego

**Large-Scale Experimental and Computational Studies to Advance Performance-Based Seismic Design**

Next-generation performance-based seismic design methodology is not only to ensure life-safety but also produce structures that have predictable performance and optimized life-cycle cost. It relies heavily on the ability to assess earthquake hazards and the associated risks in terms of structural and non-structural damage and collapse. The performance of a structural system during a seismic event depends not only on the behavior of individual structural elements, but also on the system-level interaction of structural and non-structural components as well as the soil-foundation-structure interaction. Large-scale laboratory testing and high-fidelity computational simulation have been playing increasingly important roles to understand such behavior and to generate quantitative data needed for the development of next-generation design codes. This presentation will provide an overview of research activities carried out in the UC San Diego structural engineering laboratories to understand the behavior of structural systems and components under extreme seismic load events and to explore novel design concepts. These include large-scale tests conducted on bridge components and building systems using the high-performance outdoor shake table, which is part of the George E. Brown, Jr. Network for Earthquake Engineering Simulation supported by the US National Science Foundation. The presentation will also cover some examples on how large-scale test data have been used to calibrate computational models developed to understand and predict detailed global and local response and failure mechanisms of concrete and masonry structures.





## Session C3

***Changing Political, Economic and Social Landscape of Southeast Asia: From Past to Present***

Chair

### Pavin Chachavalpongpun

Associate Professor, Center for Southeast Asian Studies, Kyoto University

**Relentless Political Crisis in Thailand: Royal Transition and Democratisation**

Thailand has fallen deeply into protracted political crisis. Since the coup of 2006, the traditional elites have attempted to maintain their power position by further politicising the monarchy to earn their political scores while undermining their enemies. In the process, electoral politics has been treated with disdain. Meanwhile, the monarchy has been put against democracy; the two entities have become antithetical to one another. But the end of King Bhumibol Adulyadej ear is nigh. The anxiety over the royal transition promoted the military to stage another coup in May 2014, against the tide of democratisation in Thailand. The disaster is in waiting.

### Krislert Samphantharak

Associate Professor of Economics, School of International Relations and Pacific Studies, UC San Diego

**Long-term Impacts of the Khmer Rouge Regime on Cambodian Households**

Existing literature has shown immediate or short-term impacts of catastrophic events (civil conflicts or natural disasters) on risk, time, and social preferences of affected households. Changes in the preferences in turn affect several household's decision makings and behaviours. This presentation will contribute to the literature by analysing long-term impacts on preferences and behaviours of household in Cambodia that were affected by the Khmer Rouge regime in 1975-78. It is based on a recent survey of farming households from six provinces of Cambodia in 2014.

### Gianluca Bonanno

Visiting Assistant Professor, Center for Southeast Asian Studies, Kyoto University

**Instability and Survival: The Bond between Independentist Groups and Border Communities in Northern Myanmar**

Peripheries in Southeast Asia are often a well of riches and a diplomatic curse at the same time. Social, economic, and political realms often overlap, with a multiplicity of interested parties fighting over their control. The benefits deriving from regional economic integration are vital to the otherwise isolated border communities. The political importance related to the physical control of the frontiers gives greater bargaining power to border groups, oftentimes belonging to ethnic minorities and in many cases asking for different levels of autonomy. This study explores the northern territories of Myanmar with the connection between independentist groups and the survival of peripheral minorities in mind, uncovering an undeniable as informal bond that has somehow managed to keep the region together.

### Lisandro E. Claudio

Post-doctoral Fellow, Center for Southeast Asian Studies, Kyoto University

**To Print or not to Print: Deflationary Economics and the Developmental State in Postwar Philippines**

Leftwing economists, from moderate liberals like Paul Krugman to radical Marxists like Robert Brenner, have criticised neoliberal economics for its fanatical commitment to fighting inflation. For them, state efforts against inflation—a phenomenon that usually accompanies state spending—evidence a broader jettisoning of state-led Keynesian interventions into economies. The bias for inflationary policies among leftwing analysts has been more pronounced in the last two years, with both Paul Krugman and Joseph Stiglitz voicing their almost unequivocal endorsement of rightwing Prime Minister Shinzo Abe’s “Abenomics,” which includes as one of its core pillars the inflationary policy of flooding world markets with Japanese yen. Abenomics, however, is slowly revealing itself to not be the victory of progressive state-planning, but a policy that privileges a large manufacturing sector over consumers. And if the current contraction of the Japanese economy is any indicator, it also appears to be a failure. The love affair between Abe and the leftwing economists begs two questions. Why have inflationary policies become so sacrosanct among leftwing commentators? And is there a way to combat inflation without falling into the trap of the Washington Consensus? This presetnation examines how earlier economic planners saw inflation-controls as part of a development framework. It looks at the career of Filipino economist Miguel Cuaderno (Governor of the Philippine Central Bank, 1949-1960), who in the early 1950s fought a valiant anti-inflationary campaign against vested manufacturing interests. It argues that, unlike contemporary anti-inflationary efforts led by the IMF, the postwar battle against inflation in the Philippines was essential to a program of state-led economic planning. Cuaderno’s focus on inflation did not simply seek to ease consumer burdens; it also engaged in deflationary policies to jumpstart imports for strategic industries, within a broader context of state-led import substitution. Apart from revealing the variants and complexity of postwar developmentalism, examining Cuaderno’s policies in the 1950s may provide new ways to rethink contemporary debates about inflation and economic planning.

## Session A5
***Recent Advancement in Radiation Oncology***

Chair

### Masahiro Hiraoka
Professor and Chair, Department of Radiation Oncology and Image-Applied Therapy, Graduate School of Medicine, Kyoto University

### Arno Mundt
Professor and Chair, Department of Radiation Medicine and Applied Sciences, UC San Diego

#### Intensity Modulated and Image Guided Radiation Therapy in the Treatment of Gynecologic Cancers

Radiation therapy (RT) has long occupied an important role in the treatment of gynecologic cancers, notably cervical and endometrial cancer. While efficacious, particularly in women with early stage disease, conventional RT fields encompass large volumes of normal tissues exposing patients to multiple acute and chronic toxicities, predominantly related to the gastrointestinal (GI) tract. Moreover, conventional RT fields expose considerable volumes of bone marrow (BM), resulting in significant hematologic toxicity, particularly in patients who also receive adjuvant chemotherapy. Since the late 1990s, we have explored the application of novel radiation planning and delivery techniques to improve the quality and delivery of treatment by reducing the volume of normal tissues irradiated, potentially reducing the risk of toxicity and improving patient outcomes. Our initial work focused on the role of sophisticated computer-based treatment planning approaches known as intensity modulated RT (IMRT), which conformed the radiation dose to the shape of the target tissues in 3 dimensions thereby sparing surrounding normal tissues. Our initial single institution experience demonstrated significant improvements over conventional treatment planning and later, in a series of reports, we reported reduced levels of acute and chronic GI toxicity in a large cohort of patients undergoing IMRT treatment. More recently, IMRT planning and delivery has been reported by other investigators in centers throughout the United States and Asia with equally favorable results, including a prospective multi-institutional trial performed in postoperative patients conducted by the Radiation Therapy Oncology Group (RTOG 0418). We have also developed and validated a method to deliver BM-sparing IMRT in patients undergoing concomitant chemoradiotherapy which was found to reduce the risk of high grade hematologic toxicities. More recently, we have extended our investigations to include image-guided RT (IGRT) approaches using positron-emission tomography (PET) and magnetic resonance imaging (MRI) to identify areas of active (red) BM, improving the quality of BM-sparing IMRT planning . Our group have explored BM-sparing IMRT in a series of prospective phase I trials with various chemotherapy regimens. Finally, we have founded a new international cooperative group focused on the testing of IMRT and IGRT in patients with cervical cancer known as the International Radiation Therapy and Oncology Consortium (IRTOC) which includes centers throughout the United States, Europe and Asia. Preliminary results of the first IRTOC trial, known as the International Evaluation of RT Technology Effectiveness in Cervical Cancer (INTERTECC) will be presented.

### Yukinori Matsuo
Department of Radiation Oncology and Image-Applied Therapy, Graduate School of Medicine, Kyoto University

#### Dynamic tumor tracking radiotherapy for real-time motion adaptation

Motion management is a vital issue in radiotherapy, especially for organs with respiratory motion. The tumor motion might sometimes limit the indication of radiotherapy. Motion adaptation techniques are classified into three levels according to time scale: inter-fractional (daily), intra-fractional (hourly or minute), and real-time (second or less) adaptations. Development of image guidance for the inter-fractional adaptation had enabled stereotactic irradiation, and that lead to marked improvement in outcomes for solitary lung or liver tumors. However, the lung and liver move rapidly and widely according to respiration every second, so that real-time motion adaptation should be applied.
We developed the Vero4DRT (MHI-TM2000) system for the real-time motion adaptation. The system has two special features. One is a pair of kV x-ray imagers which can monitor a 3-dimensional position of tumor in real time. The other is a gimbaled x-ray head which enables tumor tracking. We performed the first treatment of dynamic tumor tracking with real-time monitoring to a lung cancer patient in September 2011.
The planning studies proved benefits in dose distributions to normal tissues surrounding the tumor without sacrificing the tumor doses. Normal lung volume receiving 20 Gy or more was reduced by 20% in lung cases. For liver cases, an average 17% reduction in the mean liver dose was achieved. Based on our initial experiences, the dynamic tracking achieved a local control rate as high as 90%. No severe toxicities have been observed. Prospective trials are under way to evaluate safety and effectiveness of the dynamic tracking radiotherapy for lung, liver and pancreas cancers.
The novel technique for real-time motion adaptation has the potential to improve the outcomes and to expand the indications of radiotherapy.





## Session A6
***Molecular Imaging in Diagnosis and Therapy***

Chair

### Hideo Saji
Professor, Department of Patho-Functional Bioanalysis, Graduate School of Pharmaceutical Sciences, Kyoto University

### Masahiro Ono
Department of Patho-Functional Bioanalysis, Graduate School of Pharmaceutical Sciences, Kyoto University

#### Molecular Imaging of beta-Amyloid Plaques in Alzheimer's Disease: From Molecular Design to Clinical Research

Molecular imaging with positron emission tomography (PET) and single photon emission computed tomography (SPECT) provides noninvasively quantitative evaluation of various biological functions *in vivo*. As the population is aging rapidly all over the world, application of the molecular imaging technique into prognosis, diagnosis, and therapy of neurodegenerative disorders including Alzheimer's disease is strongly expected.
Deposition of beta-amyloid plaques in the brain is one of the key neuropathological features in Alzheimer's disease. Since beta-amyloid plaques are observed in the brain from early stage of Alzheimer's disease, *in vivo* imaging of them with PET and SPECT may become a valuable tool for the early and noninvasive diagnosis and serve as a surrogate marker for neuropathogenetic studies of Alzheimer's disease. Furthermore, quantitative evaluation of beta-amyloid plaques in the brain could also accelerate the evaluation of the efficacy of anti-amyloid therapies.
We have developed a number of molecular imaging probes for PET and SPECT that target beta-amyloid plaques based on a variety of scaffolds[1].
In this presentation, I would like to introduce our research on the development of PET imaging agents with the benzofuran scaffold from their molecular design to clinical research.

Reference 1) Ono M and Saji H. Recent Advances in Molecular Imaging Probes for beta-Amyloid Plaques. *MedChemComm*, 2015, doi:10.1039/c4md00365a, *REVIEW*.

### Takayoshi Ishimori
Department of Diagnostic Imaging and Nuclear Medicine, Graduate School of Medicine, Kyoto University

#### Recent Advancement in Clinical Application of Molecular Imaging in Oncology

Molecular imaging has been applied to oncology for cancer detection, differentiation from other lesions, staging/re-stating, as well as the characterization of cancer phenotype and response assessment. Since most malignant tumors show increased glucose metabolism, positron emission tomography (PET) using $^{18}$F-labeled fluorodeoxyglucose (FDG) has been widely used in the clinical practice, and clinical utility of whole body imaging using a dedicated PET/CT scanner is established.
In addition to whole body PET/CT, a dedicated-breast PET scanner (dbPET) with higher spatial resolution and sensitivity has been developed for breast imaging. The dbPET scanner is clinically feasible and yield reasonably high sensitivity. The dbPET scanner is also feasible to evaluate therapeutic response in earlier stage after neoadjuvant treatment in patients with locally-advanced breast cancer.
Neuroendocrine tumors (NETs), usually expressing somatostatin receptors, are often not FDG-avid, for which conventional FDG-PET/CT does not always provide useful information for therapeutic management in the clinical practice. 111In-octreotide has been used in Europe and US as somatostatin receptor scintigraphy (SRS), but it is not routinely available in Japan. $^{68}$Ga-labeled tracers, including $^{68}$Ga-DOTATOC, have been increasing in use for SRS. In our study, $^{68}$Ga-DOTATOC-PET/CT was useful for detecting NETs especially when recurrence or metastasis was suspected due to high hormone levels after surgery. $^{68}$Ga-DOTATOC PET/CT would also be a feasible option for localization of causative tumors in patients with tumor-induced osteomalacia (TIO), a rare paraneoplastic syndrome caused by a benign mesenchymal tumor, called phosphaturic mesenchymal tumor. Hypophosphatemia and osteomalacia are caused by fibroblast growth factor 23 (FGF-23) produced by these tumors.
In this session, our clinical experiences of molecular imaging in oncology including FDG-PET/CT, dbPET and $^{68}$Ga-DOTATOC PET/CT will be presented.

### David Vera
Professor of Radiology and of Surgery; Co-Director, UCSD Molecular Imaging Program, UC San Diego

#### A Flexible Platform Technology for the Construction of Receptor-Targeted Molecular Imaging Agents

In 2014 the United States FDA and the European Medicines Agency approved Technetium-99m-labeled Tilmanocept for sentinel lymph node mapping. These approvals represent the first clinical application of a flexible platform technology for the construction of receptor-specific imaging agents.
The chemical platform consists of a modified dextran that carries multiple units of amino-terminated leashes. Clinical grade dextran is available in molecular weights ranging from 1 to 500 kilodaltons. This provides flexibility in molecular size, permitting the construction of a small molecular-weight agent that can rapidly enter the interstitial space or very large molecular imaging agents that remain in the plasma. Tilmanocept uses C10, which is a clinical grade dextran with an average molecular weight of 10,500 kDa. Upon peritumoral administration, tilmanocept rapidly enters the lymph channels that drain the tumor. The amino-terminated leashes enable the covalent attachment of receptor substrates and imaging reporters. An average of 25 mannose units are covalently attached to the dextran backbone of Tilmanocept. This imparts sub-nanomolar ($K_D$=0.2 nM) to CD206, a receptor found on macrophages, dendritic cells, mesangial cells, and bacteria. Avid receptor affinity permits high extraction and retention by receptors of the sentinel lymph node-- the first lymph node that drains the cancer. Also attached to the dextran backbone is DTPA, which is capable of forming co-ordinate-covalent bonds with metal atoms, such as Technetium-99m and Gallium-68. DPTA is capable of binding all of the radioactive atoms to the dextran backbone, such that very few DTPA-bearing tilmanocept molecules are required to achieve high levels of radioactivity. This allows the administration of radio-labeled tilmanocept with an amount of radioactivity that is adequate for good nuclear imaging, but does not contain an amount of tilmanocept that would saturate all of the receptors within the sentinel lymph node. If saturation occurs, the next lymph node in the chain (which in not a sentinel lymph node) would become radioactive.
A fluorescent-labeled version of Tilmanocept has been synthesized by covalently attaching a near infra-red fluorophore. This imaging reporter is compatible with hand-held fluorescence imagers and the laparoscopic cameras of robotic-assisted surgical systems.
Other examples of the technology are radioactive- and fluorescent-labeled galactosyl-dextran for imaging the asialoglycoprotein receptor located on hepatocytes, and Tc-99m-labeled or Ga-68-labeled peptidyl-dextran for imaging integrin or insulin receptors.

## Session A7

*New Horizon in Gastroenterology: Bio-Medical and Bio-Engineering Approaches*

Chair

### Yuzo Kodama

Department of Gastroenterology and Hepatology, Kyoto University Graduate School of Medicine, Kyoto University

### Geert Schmid-Schoenbein

Distinguished Professor and Chairman, Department of Bioengineering, Adjunct Professor in Medicine, UC San Diego

#### Autodigestion and Inflammation: A bioengineering Perspectivie of Disease and Death

A large body of clinical evidence indicates that diseases are associated with markers for inflammation. Since the inflammatory cascade serves as a tissue repair, this evidence indicates that in disease a tissue repair process is under way. The fundamental question arises what mechanism may cause injury to a tissue that triggers the inflammation and the repair. Besides tissue injury due to infections, trauma, temperature or chemical exposures, there are many non-infectious inflammatory conditions whose origin is unknown. We propose an alternative and previously unrecognized mechanism that leads to inflammation due to pancreatic digestive enzymes. These powerful enzymes, required for normal digestion, are synthesized in the pancreas and transported into the lumen of the small intestine where they are fully activated in order to break down biological molecules. The epithelial mucosal barrier and its associated mucin layer prevent escape of the digestive enzymes into the wall of the intestine. If the mucosal barrier leaks digestive enzymes, autodigestion by one's own digestive enzymes occurs and leads to a destruction of the intestinal mucosa. We present evidence that in hemorrhagic and different septic shock autodigestion is the predominant cause of cell/organ dysfunction, including the acute insulin resistance (Type II diabetes) after cleavage of the ectodomain of the insulin receptor by unchecked proteases, tissue lesion formation, acute respiratory distress, heart failure and death. Digestive enzymes appear in the systemic circulation and cause widespread tissue destruction by autodigestion. Blockade of pancreatic digestive enzymes inside the lumen of the small intestine serves to minimize autodigestion in experimental forms of shock and significantly improves cell and organ dysfunctions. These results suggest that the pancreatic digestive enzymes may play a central role in disease and death as a price for the lifelong benefit of digestion. Supported by GM 85072 and a gift from Leading Biosciences Inc., San Diego, CA.

### Tomohiro Watanabe

Department of Gastroenterology and Hepatology, Kyoto University Graduate School of Medicine, Kyoto University

#### Immune Mechanisms of Pancreatitis

Acute pancreatitis is a sudden inflammation of the exocrine pancreas, whereas chronic pancreatitis is a long-standing inflammation of both the exocrine and the endocrine pancreas. Autodigestion of the pancreas by pathologic intra-acinar trypsinogen activation has been considered to be the most important mechanism for the development of pancreatic inflammation. However, recent studies provide evidence that both innate and adaptive immune responses are involved in the development of pancreatitis in addition to the autodigestion of the tissue. Activation of pathogen recognition receptors expressed in pancreatic innate immune cells by microbial antigens derived from intestinal microflora and endogenous antigens from necrotic pancreatic tissue induces acute pancreatitis through the production of pro-inflammatory cytokines and chemokines. In addition, recent studies established a new concept of immunoglobulin G4 (IgG4)-related autoimmune pancreatitis in which IgG4-expressing plasma cells are seen in the lesions of chronic pancreatitis. Thus, although autodigestion by activated pancreatic enzymes is a necessary component for pancreatic injury, pathogenic immune responses play key roles in the development of pancreatitis. Here we would like to present our recent data regarding pathogenic immune responses leading to the development of acute pancreatitis and IgG4-related autoimmune pancreatitis.





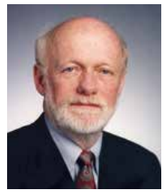
## Session A8

*New Horizon in Pharmacology and Pharmaceutical Sciences*

Chair

### Yoshinobu Takakura

Director, Professor, Graduate School of Pharmaceutical Sciences, Kyoto University



### Palmer Taylor

Professor and Sandra & Monroe Trout Chair in Pharmacology; Founding & Emeritus Dean, Skaggs School of Pharmacy & Pharmaceutical Sciences, UC San Diego

#### Natural Product Templates and Freeze-frame, Click-chemistry for New Therapeutic Designs in the Cholinergic Nervous System

Since the cholinergic nervous system controls peripheral motor activity and plays a critical role in central cholinergic neurotransmission through pre-synaptic and post-synaptic actions in vertebrates, it is a vulnerable target in evolved nature for predation of other species or protection from predation. This also becomes an Achilles Heel or limitation owing to the multiplicity of subtypes of both nicotinic and muscarinic acetylcholine receptors. Often complexes with the natural products serve as structural leads for determining the binding determinants and poses. We have chosen two targets of cholinergic neurotransmission, acetylcholinesterase (AChE) and the nicotinic acetylcholine receptor (nAChR), to employ new approaches for the design of selective therapeutic agents. To this end we have employed human AChE and the acetylcholine binding protein (AChBP) to serve as templates in the design. The chemistry entails the development of azide and alkyne fragments that when in proximity, in situ, will react to form a triazole that interacts with high affinity and is site directed. Initial design involves formation of these complexes in situ and their characterization by crystallographic and solution-based analyses.

### Shuji Kaneko

Professor, Department of Molecular Pharmacology, Graduate School of Pharmaceutical Sciences, Kyoto University

#### Pathophysiological roles of TRP channels and their applications to drug discovery for intractable pain

TRP channels comprise a large family of tetrameric cation channels that respond to diverse forms of sensory input. We have been investigating the involvements of neuronal and glial TRP channels in pain transduction and modulation. Here, we present two animal models in which individual TRP subtypes exert particular roles in eliciting intractable pain.

1) Cold hypersensitivity: A platinum-based chemotherapeutic agent, oxaliplatin (OHP), causes an unusual acute peripheral neuropathy, which is triggered or exacerbated by cold in almost all patients rapidly after infusion. In mice, a single intraperitoneal administration of OHP (1-10 mg/kg) induced cold hypersensitivity within 2 h. The acute cold hypersensitivity was mimicked by infusion of the OHP metabolite, oxalic acid, and abolished by the TRPA1 antagonist HC-030031 or by TRPA1 deficiency. Our in vitro study revealed that OHP and oxalate sensitize TRPA1 by inhibiting proline hydroxylase, and that OHP produces reactive oxygen species (ROS) that opens TRPA1 channels by cysteine oxidation.

2) Neuropathic pain: Neuroinflammation mediated by the interaction between immune cells and neurons plays an important role in the pathogenesis of neuropathic pain. TRPM2 is expressed in immune cells, and acts as a sensor for ROS. Using TRPM2-knockout mice, we demonstrated that TRPM2 deficiency attenuated pain behaviors in various kinds of inflammatory and neuropathic pain, but not in nociceptive pain models. In the neuropathic pain model, TRPM2 deficiency diminished infiltration of neutrophils mediated through CXCL2 production from macrophages around the injured peripheral nerves, and inhibited the activation of spinal microglia. In an in vitro study with mouse primary microglia, lipopolysaccharide in the presence of interferon-$\gamma$ activated TRPM2-mediated $Ca^{2+}$ signaling that resulted in elevated NO and CXCL2 production. The spinal infiltration of macrophages mediated by TRPM2 may contribute to the pathogenesis of neuropathic pain.

## Session C4

***New Horizon of Advanced Energy for Sustainable Development***

Chair

### Kazunobu Nagasaki

Professor, Institute of Advanced Energy, Graduate School of Energy Science, Kyoto University

#### The Heliotron J Program for Advanced Fusion Energy Research

Nuclear fusion is expected to be an inexhaustible energy source for future generations. Helical systems, which utilizes external magnetic field for plasma equilibrium, have a potential for an attractive fusion reactor, featuring steady state operation, no major disruption and minimum recirculating power. The “heliotron” concept was invented and has been developed for five decades in Kyoto University. Following the successful development results, we started plasma experiments on the advanced helical device, Heliotron J (R = 1.2 m, a ~ 0.2 m, B ≦1.5 T), in 2000, which is characterized by low magnetic shear and magnetic well. The main goals of the Heliotron J project is to expand the advanced concept of helical systems and to deepen understanding of the plasma physics. The magnetic configuration is based on quasi-omnigeneity by drift optimization, satisfying both good MHD stability and reduction in neoclassical transport simultaneously. The magnetic configuration is formed by a combination of an L/M=1/4 helical coil, two kinds of toroidal coils, inner and outer vertical coils, enabling us to study the effect of confinement properties on the magnetic configuration. This paper reviews the basic concept and recent experimental progress in the Heliotron J device from the viewpoint of confinement, transport and stability. The experimental results includes extension of plasma operational regime using novel fuel gas injection, formation of internal transport barrier, toroidal flow, meso-scale structure formation and related edge plasma turbulence, plasma start-up using neutral beam injection (NBI) assisted by 2.45 GHz microwaves, formation and confinement of fast ions by NBI and ion cyclotron resonant minority heating, and control of fast-ion-driven MHD instabilities and measurement of impurity behavior.

### Russell Doerner

Research Scientist, Center for Energy Research, UC San Diego

#### Plasma-Surface Interaction Research: Where We Are and Where We Need to Go

As nuclear fusion research programs across the world continue to progress toward burning plasma relevant operational scenarios, more and more stress is placed on the systems surrounding the confined plasma. Increased plasma parameters coupled with longer pulse duration focusses attention on the behavior of the surfaces required to remove the emerging power and interact with the escaping plasma particles. The importance of developing the understanding of plasma-material interactions to ensure the success of the plasma-facing components consistently ranks high on lists of required research throughout the world’s fusion research programs. This presentation describes one key element of the U.S. technology program developed to provide such an understanding of plasma-material interactions; namely the PISCES linear plasma devices located at UC SAN DIEGO. Linear plasma devices bridge the gap between single effect measurements (such as ion beam sputtering measurements, or electron beam high-heat flux measurements) and more complicated toroidal plasma confinement facilities. The PISCES linear plasma devices provide the opportunity to perform controlled, systematic investigations of the synergy and coupling between the variety of processes taking place at the interface between a material object and the incident high-energy plasma. The physics governing the PISCES plasma generating sources and their operational parameters will first be described. In addition, the diagnostic capabilities necessary to interrogate both the plasma and the materials will be detailed. A summary of recent research results will be discussed and finally, the direction of future research efforts, along with a description of unresolved research topics in plasma-material interactions will be presented.





## Plenary Closing/Wrap-Up Panel Session

***Next Steps towards New Era of Trans-Pacific Knowledge Interactions***

Chair

### Junichi Mori

Director General, Organization for the Promotion of International Relations, Kyoto University

### Paul K. L. Yu

William S.C. Chang Endowed Chair Professor at Electrical and Computer Engineering Department, and Provost of Revelle College, UC San Diego

### David Vera

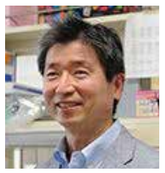
Professor of Radiology and of Surgery; Co-Director, UCSD Molecular Imaging Program, UC San Diego

### Michelle Hermas

Director, Inernational Affairs, UC San Diego

### Nagahiro Minato

Executive Vice President, Research, Kyoto University



### Yoshio Koyanagi

Director, Professor, Institute for Virus Research (IVR), Kyoto University

### Carl Becker

Professor, Kokoro Research Center, Kyoto University

# Kyoto University International Symposium

Satellite of 1st Kyoto University - UC San Diego Joint Symposium

## FRONTIERS OF BIOMEDICAL RESEARCH IN KYOTO AND LA JOLLA

**March 13 Friday, 2015**
**Kyoto Hotel Okura**

# Time Schedule (March 13)

## Satellite of 1st Kyoto University - UC San Diego Joint Symposium
## *"Frontiers of Biomedical Research in Kyoto and La Jolla"*

### Kyoto Hotel Okura
### (Room Gyo-un)

9:00- **Opening Address:** Tomohisa Kato

9:10-10:30 ***Keynote session***
Chair: **Nagahiro Minato** (Kyoto University)
**Tasuku Honjo** (Kyoto University)
*"Cancer Immunotherapy by Blockade of a Negative Immuno Regulator PD-1"*
**Michael Karin** (UC San Diego)
*"Inflammation, Immunity and Cancer"*

10:35-11:55 **Session 1:** ***Beyond Signaling Towards Cell Fate***
Chair: **Eisuke Nishida** (Kyoto University)
**Michiyuki Matsuda** (Kyoto University)
*"Intercellular Signal Transduction: Visualization and Modeling"*
**Kun-Liang Guan** (UC San Diego)
*"The Hippo Pathway in Cell Growth, Organ Size, and Tumorigenesis"*

Lunch Break

13:00-14:20 **Session 2:** ***Stem Cell***
Chair: **Karl Willert** (UC San Diego)
**Yasuhiro Yamada** (Kyoto University)
*"Dissecting Cancer Biology by Studying Induced Pluripotency"*
**Lawrence Goldstein** (UC San Diego)
*"Using Human Stem Cells to Probe the Secrets of Alzheimer's Disease"*

14:20-15:40 **Session 3:** ***Gene Expression and Development***
Chair: **Masatoshi Hagiwara** (Kyoto University)
**Mitinori Saitou** (Kyoto University)
*"Mechanism and Reconstitution In Vitro of Mammalian Germ Cell Development"*
**Juan Carlos Izpisua Belmonte** (Salk Inst / UCSD)
*"In Vivo and Vitro Regenerative Medicine Strategies"*

Coffee Break



15:50-17:10 **Session 4:** ***Neuroscience***
Chair: **Lawrence Goldstein** (UC San Diego)
**Shigetada Nakanishi** (OBI / Kyoto University)
*"Integrative Neural Mechanism in Selection of Animal Behavior"*
**Don W. Cleveland** (UC San Diego)
*"Gene Silencing Therapy for Neurodegenerative Disease"*

17:10-18:50 **Session 5:** ***Clinical Application of Stem Cells***
Chair: **Catriona Jamieson** (UC San Diego)
**Jun Takahashi** (Kyoto University)
*"Challenges towards Stem Cell Therapy for Parkinson's Disease"*
**Martin Marsala** (UC San Diego)
*"Spinal Cell-Replacement Therapies for Treatment of Spinal Traumatic Injury"*
**Koji Eto** (Kyoto University)
*"Large Scale Production System by iPS Cell-Derived Platelets"*

19:00- **Networking Banquet (Room Sui-un)**

# Satellite Symposium Organization

## Biomedical Satellite Symposium

## *"Frontiers of Biomedical Research in Kyoto and La Jolla"*

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Nagahiro Minato (Executive Vice President of Kyoto University, Committee President)
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Jun Takahashi, Makoto Kato-Azuma
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(UC San Diego)

### Program Committee

Tomohisa Kato (Chair), Jun Takahashi
(Kyoto University)
Lawrence Goldstein, Michael Karin
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# Floor Map (Kyoto Hotel Okura)

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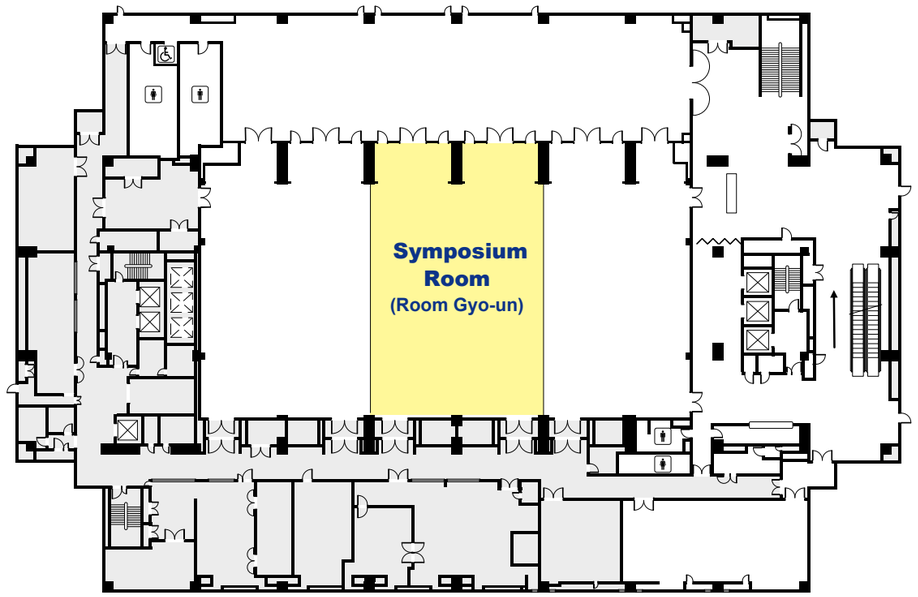


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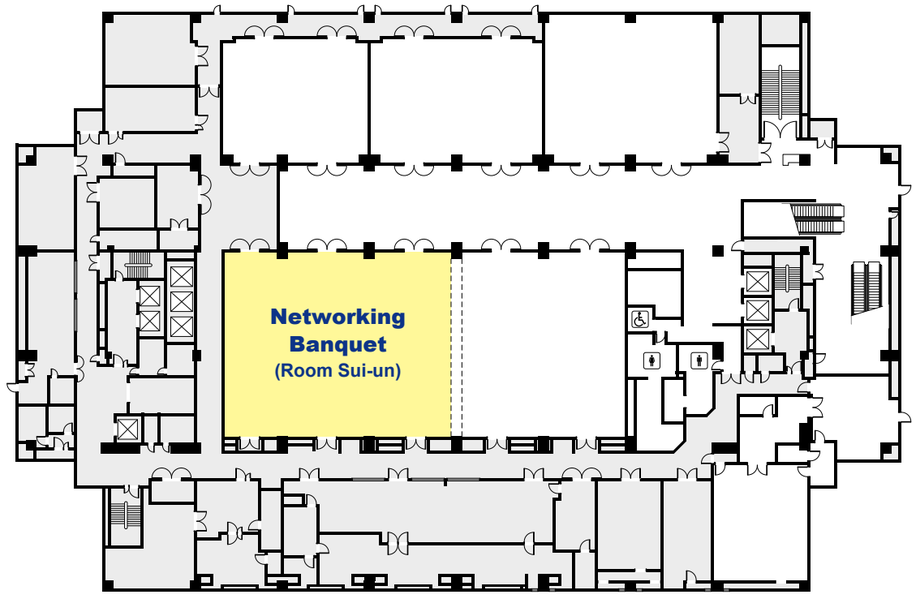




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TEL(077)568-2481／FAX(077)568-2410
神戸営業部 〒650-0047 兵庫県神戸市中央区港島南町5丁目2番5
TEL(078)306-6060／FAX(078)306-6070
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だれもが、その一日一日を豊かに、そして大切に生きるために——。
私たちは新薬の研究開発を通して、新たな価値の創造に取り組んでいます。
世界中の人たちのすこやかな生活に貢献するために
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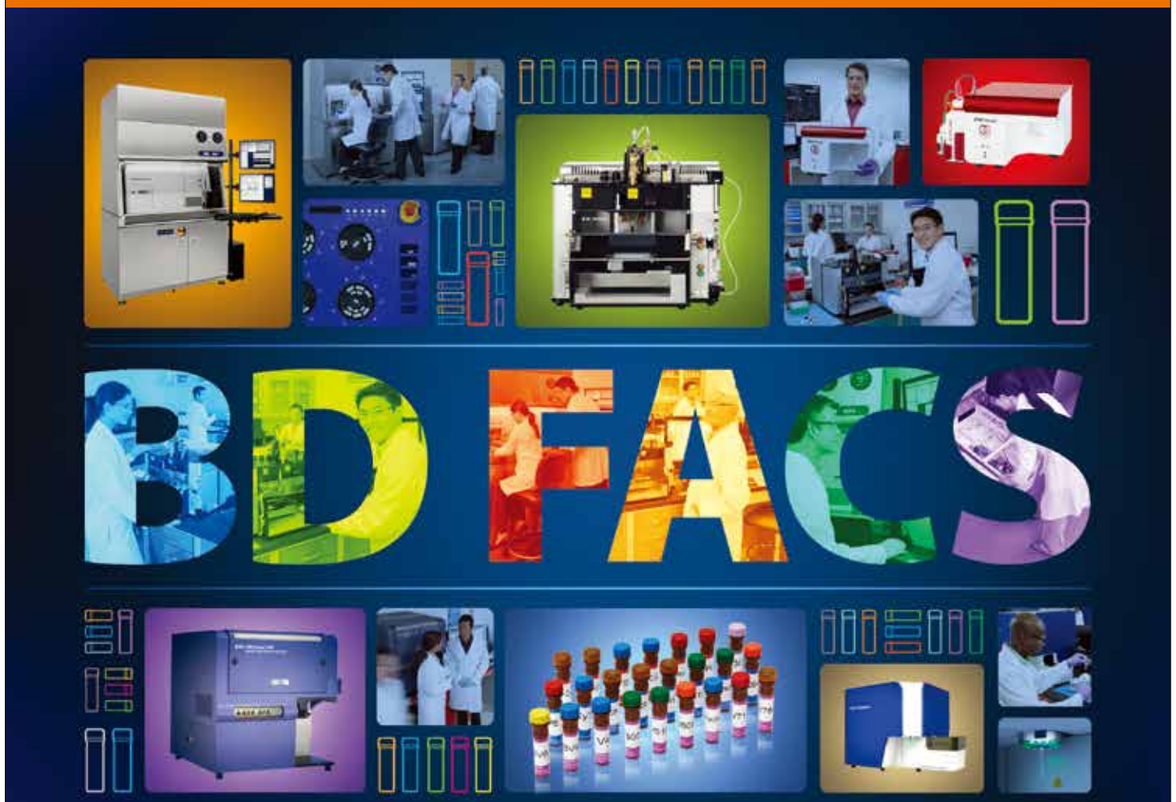
# BD FACS™ Research Systems to Empower the Next Generation of Research




BD Helping all people live healthy lives

## 40 years of trust.

Across the past 40 years we've been honored to be the brand you've trusted to facilitate and speed your work to discover more about life around us and to improve the human condition.

BD FACS™ brand research systems stand for quality, relentless innovation, and tireless dedication to service.

Our platforms continue to keep pace with the accelerating speed of discovery, out-innovating the field so you have reliable and consistent results from experiment to experiment, operator and sample protection from fully integrated biosafety and cell sorting, more space on your benchtop, and more flexibility for your experiments.

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For more information please visit **bdbiosciences.com/go/facs.**



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BioResearch

Lonza

# Clonetics™ Primary Cells and Media
# The Trusted Path to Relevant Results

## Choose Lonza for Optimal Cell Performance

Lonza's primary cells and media are globally renowned for quality and reliability. With over 40 years of experience and referenced in five times more publications than other suppliers, Lonza can deliver the quality you need to obtain reliable and biologically relevant results every time.

Our breadth of cell type offering is unmatched and spans across research areas such as respiratory, neurobiology, cancer, stem cells, diabetes, cardiovascular and others.

**Clonetics™ Primary Cells Portfolio:**
- $100^{+}$ cell types – cryopreserved or proliferating, human and animal
- Broad donor variety – large selection of donors for most cell types
- Cells from normal and diseased tissues
- Optimized Growth Media BulletKit™ for each cell type

**The trusted path to results starts with Lonza.**



**www.lonza.com/primary**

**ロンザジャパン株式会社** バイオサイエンス事業部

〒104-6591 東京都中央区明石町8-1 聖路加タワー 39階　TEL：03-6264-0620　website：www.lonzabio.jp/　E-mail : bioscience.sales.jp@lonza.com

# LIFEbank™ 疾患特異的線維芽細胞

## Fibroblasts

DV Biologics (DV バイオロジクス ) 社の LIFEbank™ 疾患特異的システムでは、
様々な疾患患者由来の線維芽細胞をラインアップしています！

BI Biological Industries Culture of Excellence

疾患特異的線維芽細胞例

- 筋萎縮性側索硬化症（ALS）
- 1 型糖尿病
- ギラン・バレー症候群
- レッグ・カルベ・ペルテス症候群　etc…
- 動静脈奇形
- パーキンソン病
- 筋ジストロフィー
- ハンチントン病

商品の詳細は web へ Go !!
記事 ID 検索 14214

- Ready-to-use（アラニルグルタミン含有）
- Xeno-Free
- フィーダーフリー / オンフィーダー用培地を選択可能

記事 ID 検索 2099

dv biologics

**NutriStem® hESC XF contains / without HSA**

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詳しい情報は、コスモ・バイオホームページのサイト内検索エンジン 記事 ID 検索 に、
この商品のページ ID（上記アイコンの数字）を入力してください。

**www.cosmobio.co.jp**

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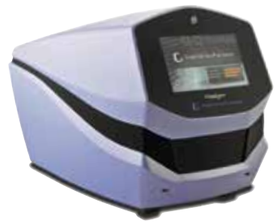
FLUIDIGM®

## 幹細胞誘導後の バリデーションや品質管理に

### シングルセルソーティングの エラーを解決

**C1™ Single-Cell Auto Prep システム**

シングルセルのキャプチャから
溶解、合成反応、回収までを自動化しました。



### マイクロ流体回路システムにより 微量なテンプレート溶液でのアッセイを可能に

ソーティングによるシングルセルのサンプルから
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**Biomark™ HD システム**

わずか 3 µL 未満の鋳型 cDNA から
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E メール：info-japan@fluidigm.com　URL：www.fluidigm.co.jp

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TPP® が提案するトリプルバッグ（3-B）

## より厳格なクリーンルームの要件に適合します。

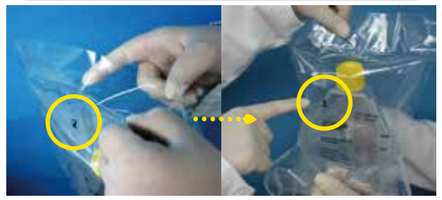
3層包装

- 製品の滅菌移動が不可欠なデリケート区域で使用可能
- 3 層のピールオフバッグに包装
- 袋には外側から 3、 2、 1 のナンバリング
- 外側のバッグが内側のバッグより大きいサイズになっているので作業中、
  内側がコンタミネーションされる心配がありません。
- 無菌性保証水準 (Sterility Assurance Level:SAL):$10^{-6}$ 以下

### Step 1

**ラボ内**
通常の環境下で外側 (-3) のピールオフバッグを剥がし、
中央（-2）を取出す。

### Step 2



**無菌エリア**
無菌エリアで中央（-2）のピールオフバッグを剥がし、
内側（-1）を取出す。

### Step 3

**無菌室**
製品を取出し培養を始める。

BM ビーエム機器株式会社
〒135-0016 東京都江東区東陽2丁目2番20 東陽駅前ビル
BM EQUIPMENT
WEB: http://www.bmbio.com　e-mail: sales@bmbio.co.jp

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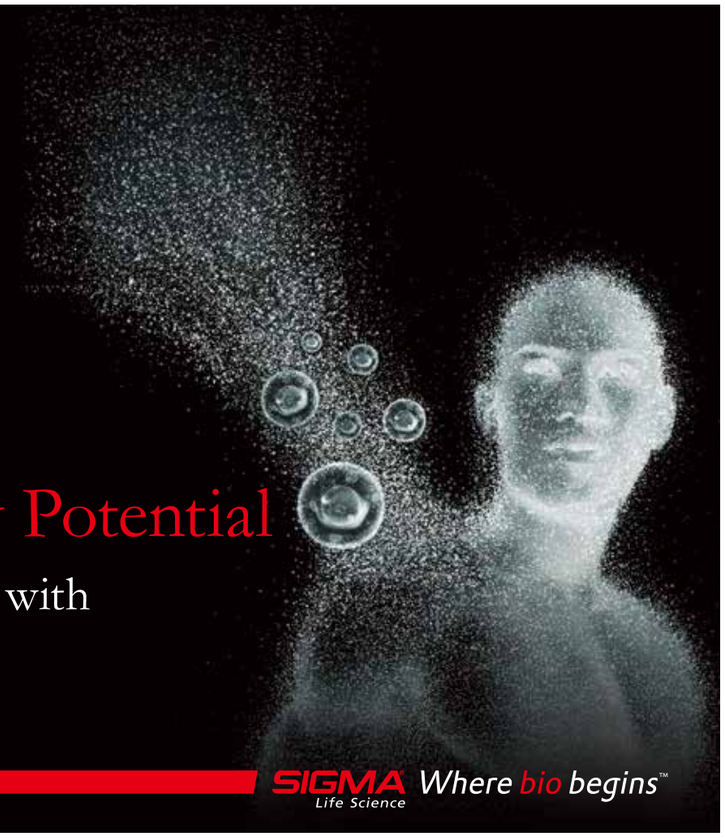
*biopotential*



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全ゲノム、エクソーム、RNA 解析のための
デスクトップ型次世代シーケンサー

NextSeq™ 500 システム

www.illuminakk.co.jp

　本製品の使用目的は研究に限定されます。

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生物由来製品、劇薬、処方箋医薬品注）

注）注意－医師等の処方箋により使用すること

OPDIVO (nivolumab)

効能・効果、用法・用量、警告・禁忌を含む使用上の注意等は添付文書をご参照ください。

製造販売（資料請求先）
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〒541-8564　大阪市中央区久太郎町1-8-2
プロモーション提携
ブリストル・マイヤーズ株式会社
〒163-1328　東京都新宿区西新宿 6-5-1

2015年2月作成

5月発売予定！

# ヒトiPS細胞ライブラリー

KAC

## 概要

・iPSアカデミアジャパン株式会社とのライセンス契約下、ディナベック株式会社のCytoTune-iPSを用いて作製したiPS細胞を販売いたします。

・インフォームドコンセントを取得した、幅広い年齢層の健常者由来の細胞10種類をライブラリー化し、5月より順次ご提供する予定です。
単品およびライブラリーとしてのご提供を予定しています。

・疾患由来iPS細胞についても順次ご提供する予定です。

・iPS細胞は液体窒素容器でお届けいたします。

・iPS細胞の使用期間は1年間です。

※ご要望に応じて、ご提供頂いた細胞からiPS細胞を作製いたします。

| 起源細胞 | 性別 | 歳代 |
|---|---|---|
| ファイブロブラスト | F | 30 |
| | F | 60 |
| ケラチノサイト | F | 30 |
| | F | 40 |
| 末梢血単核球 | F | 20 |
| | M | 70 |
| T 細胞 | M | 50 |
| 肝細胞 | M | 20 |
| | M | 10 |
| | M | <10 |

お問い合わせは・・・

KAC
株式会社ケーエーシー
http://www.kacnet.co.jp/

試薬事業部
〒520-3001 滋賀県栗東市東坂531-1
TEL:077-558-3971　FAX:077-558-3972
E-mail:shiyaku-info@kacnet.co.jp

▸試薬営業グループ（東日本エリア）
東京支社 〒110-0005 東京都台東区上野1丁目4-4
藤井ビル3階
TEL:03-5807-7162　FAX:03-5807-7163
▸試薬営業グループ（西日本エリア）
本社 〒604-8423 京都市中京区西ノ京西月光町40番地
TEL:075-801-9311　FAX:075-801-7688


エンジン7年保証

スターリングエンジン搭載

# 超低温ECOフリーザー

- $CO_2$排出量 約40%(従来機種比)
- 消費電力 約40%(従来機種比)
- 幅広い温度設定
- ユニバーサル電源

Upright Freezer

## SU780UE

**業界最高の性能**

- 最少のエネルギー消費。一日当たり8キロワット時未満(−80度時)
- 解凍温度−80度への最初の予冷が最速で7時間未満
- ドア開放時の温度リカバリータイムが最速で、−80度まで1.7時間未満
- −80度から−60度までの維持時間が最も長くとも5時間
- 床面積1平方フィート当たりの保管能力が最大
- すべての押しふみ口に接続可能

STIRLING ULTRACOLD

non freon ノンフロン製品

### 仕　様

| | |
|---|---|
| 品名 | 超低温ECOフリーザー |
| 品番 | SU780UE |
| 温度設定範囲 | -20℃～-86℃ |
| 外形寸法(H×D×W) | 2007×869×914mm |
| 内形寸法(H×D×W) | 1537×695×739mm |
| 重量 | 283kg(棚板2枚時) |
| 内容量 | 780L(2インチ箱 600箱相当) |
| 棚 | 棚6段、内扉3枚 |
| 冷媒 | HC,R170(99g) |
| 温度表示 | 1℃単位　グラフィカルタッチスクリーン |

| | |
|---|---|
| 警報 | 温度異常、ドア開放 |
| 電源容量 | ユニバーサル電源（50Hz,60Hz共用）単相100～240V　コンセント容量15A(アース付)(SU780UEの最大出力1200W) |
| 消費電力 | <8kWh/day |
| 排熱量(室内冷却への負荷) | 12808TU/h(3200kcal/h) |
| 騒音レベル(1m) | <60dB(A) |
| 温度記録 | 30日間 |
| 制御バッテリー | 48時間バックアップ |
| 使用環境 | +5℃～+35℃ |

**環境に対しての貢献が認められ表彰を授与されました。(アメリカ合衆国にて)**

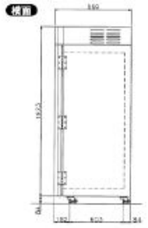
- 国際的に評価の高いイノベーション
- エネルギー使用50%減を達成
- 業界最高水準の性能
- 100% 自然冷媒による冷却システム

International Society for Biological and Environmental Repositories

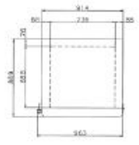
### 図　面

正面

横置



上面



STIRLING ULTRACOLD

STIRLING ULTRACOLD JAPAN,INC.
スターリング ウルトラコールド ジャパン 株式会社
〒669-1161
兵庫県神戸市北区道場町生野1172-612
TEL.0120-566-779
http://www.suj-inc.co.jp/

### お問い合わせ

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