

Director Nakatsuji Addresses Plenary at World Stem Cell Summit in Pasadena

Prof Nakatsuji is the only Japanese scientist to address the entire gathering during its 3-day annual conference in October.



Professor and iCeMS Director **Norio Nakatsuji** appeared as a plenary speaker at the World Stem Cell Summit 2011, taking place October 3-5 at the Pasadena Convention Center in California, delivering remarks on strategies for advancing regenerative medicine.

The annual conference, organized by the US-based nonprofit Genetics Policy Institute (GPI), was first held in 2005, and since then has annually attracted around 1,000 researchers, industry leaders, lawmakers, regulators, patient advocates, legal experts, investors, and philanthropists. Organizers this year included the California Institute for Regenerative Medicine (CIRM), the California Institute of Technology, and the Consulate General of Canada in Los Angeles. The iCeMS as well as the Harvard Stem Cell Institute (HSCI) were among the 120 organizations endorsing the event. ■

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Fast, Cheap, & Accurate: Detecting CO₂ with a Fluorescent Twist

In findings published in *Nature Materials*, iCeMS scientists reveal a radically new and visual gas detection technique.

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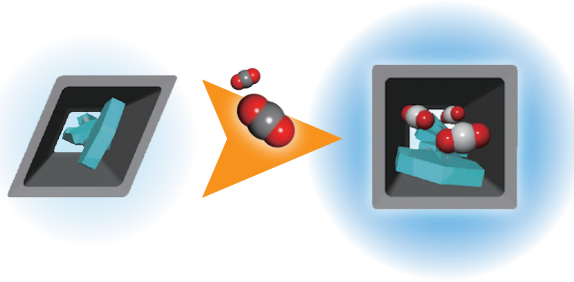
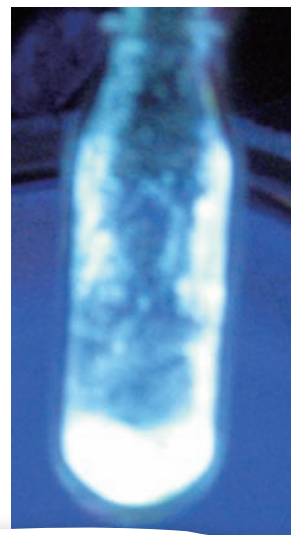


Diagram (above left) of a porous coordination polymer (PCP) infused with DSB, resulting in the polymer framework becoming skewed. As CO₂ molecules are adsorbed (above right), the PCP straightens and fluoresces more brightly. This fluorescence can be seen in the photograph at right. (Courtesy Kitagawa Lab)



The iCeMS' Expanding Global Network

New partners include MRC-CRM, JNCASR, MIPT, and Biocon.

The iCeMS global network of research partner institutions is expanding rapidly, with memoranda of understanding signed recently with the **MRC Centre for Regenerative Medicine** (CRM) at the University of Edinburgh, the **Jawaharlal Nehru Centre for Advanced Scientific Research** (JNCASR) in Bangalore, India, the **Moscow Institute of Physics and Technology** (MIPT), and the **Medicinal Bioconvergence Research Center** (Biocon) at Seoul National University.

While providing a framework for joint research projects, the MoUs also call for exchanges of researchers, joint hosting of symposia, possible satellite laboratories, and other cooperative efforts. In the case of **Heidelberg University**, an MoU has been signed with Kyoto University, and two joint symposia have been held, with a third in planning.

The iCeMS already has a satellite at Gifu University,

headed by Prof **Makoto Kiso**. The list of other ongoing partnerships includes the following institutions in Japan and abroad (pictured at right):

- California NanoSystems Institute (CNSI), UCLA, USA
- Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG), Germany
- National Centre for Biological Sciences (NCBS) and Institute for Stem Cell Biology and Regenerative Medicine (inStem), Bangalore, India
- Purdue University Center for Basic and Applied Membrane Sciences (PUBAMS), USA
- Riken Center for Developmental Biology (CDB), Kobe
- Wellcome Trust Centre for Stem Cell Research (CSCR), The University of Cambridge, UK ■

“Fast, Cheap, & Accurate” ...continued from page 1

Detecting specific gases in the air is possible using a number of different existing technologies, but typically all of these suffer from one or more drawbacks including high energy cost, large size, slow detection speed, and sensitivity to humidity.

Overcoming these deficiencies with a unique approach, a team based at Kyoto University has designed an inexpensive new material capable of quick and accurate detection of a specific gas under a wide variety of circumstances. Moreover, in addition to being reusable, the compound gives off variable degrees of visible light in correspondence with different gas concentrations, providing for development of easy to use monitoring devices.

The findings, published in a recent issue of *Nature Materials*, describe the use of a flexible crystalline material (porous coordination polymer, or PCP) that transforms according to changes in the environment. When infused with a fluorescent reporter molecule (distyrylbenzene, or DSB), the composite becomes sensitive specifically to carbon dioxide gas, glowing with varying intensity based on changing concentrations of the gas. Lead author for the paper was Dr **Nobuhiro Yanai** of the university's Graduate School of Engineering.

“The real test for us was to see whether the composite could differentiate between carbon dioxide and acetylene, which have similar physiochemical properties,” explains Assoc Prof **Takashi Uemura**, also of the Graduate School of Engineering. “Our findings clearly show that this PCP-DSB combination reacts very differently to the two gases, making accurate CO₂ detection possible in a wide variety of applications.”

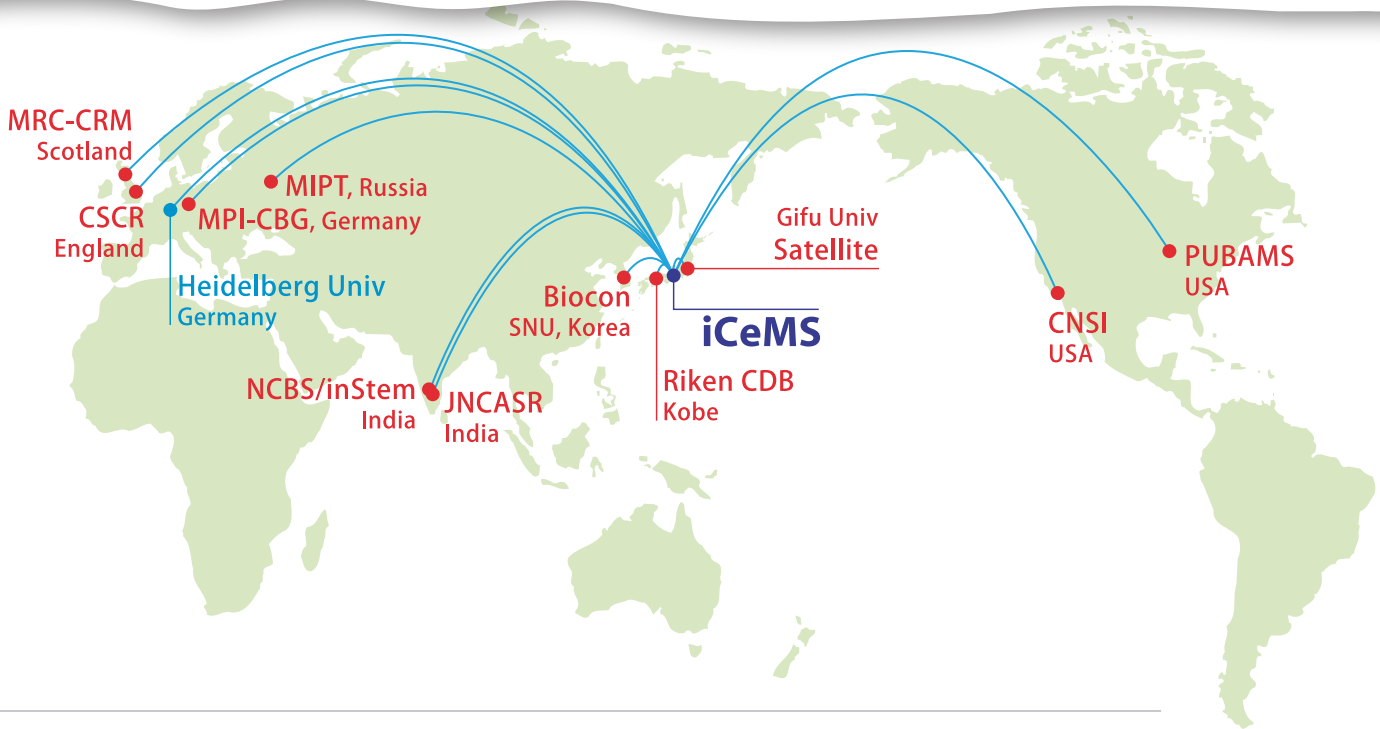
In its natural state, DSB is a long, flat molecule, which emits a blue light. When adsorbed by the PCP framework, DSB molecules twist, causing the entire PCP structure to also become skewed. In this condition, the glow of DSB diminishes significantly.

“On this occasion we observed that the presence of CO₂ causes the DSB molecules to revert to their flat, brightly fluorescent form, while also returning the PCP grid to its usual state,” adds Professor and iCeMS deputy director **Susumu Kitagawa**. “And importantly, these steps can be reversed without causing any significant changes to the composite, making possible the development of a wide variety of specific, inexpensive, reusable gas detectors.”

Additional details (including media coverage information) are available on the iCeMS website. ■

Gas detection by structural variations of fluorescent guest molecules in a flexible porous coordination polymer by Nobuhiro Yanai, Koji Kitayama, Yuh Hijikata, Hiroshi Sato, Ryotaro Matsuda, Yoshiki Kubota, Masaki Takata, Motohiro Mizuno, Takashi Uemura, and Susumu Kitagawa. *Nature Materials*. Published online September 4, 2011. Doi 10.1038/nmat3104.

This work was supported by the Murata Science Foundation, ERATO-JST, a Grant-in-Aid for Young Scientists (A), and a Grant-in-Aid for Scientific Research on Innovative Area "Emergence in Chemistry" from MEXT. The synchrotron radiation experiments were carried out at BLo2B2 in SPring-8 with the approval of the Japan Synchrotron Radiation Research Institute (JASRI) (Proposal no. 2009B1320).



“World Stem Cell Summit” ...continued from page 1



Above: the summit venue at the Pasadena Civic Auditorium

Below: Prof Nakatsuji taking part in a roundtable discussion



Below: a panel discussion featuring Prof Nakatsuji



Above: Prof Nakatsuji meeting with Prof **Rudolf Jaenisch** of the Massachusetts Institute of Technology

all photos © iCeMS 2011

Navigating the Funding Labyrinth

Researchers receive training in applying for *Kakenhi* grants.

Grants-in-Aid for Scientific Research, commonly known as *Kakenhi* grants, are some of the most important sources of government funding available to researchers in Japan.

In addition to extensive information available on the website of the Japan Society for the Promotion of Science (JSPS), which administers the funding program, the iCeMS annually hosts a highly-popular

seminar offering advice and counselling related to the preparation and submission of applications. These sessions are presented entirely in English.

At this year's seminar, held October 5, a capacity crowd attended presentations by Administrative Director **Shinji Tomita**, Asst Prof **Yong-Woon Han**, Assoc Prof **Mineko Kengaku**, Prof **Motonari Uesugi**, and Funding Management office staff member **Noriko Ohmura**. ■



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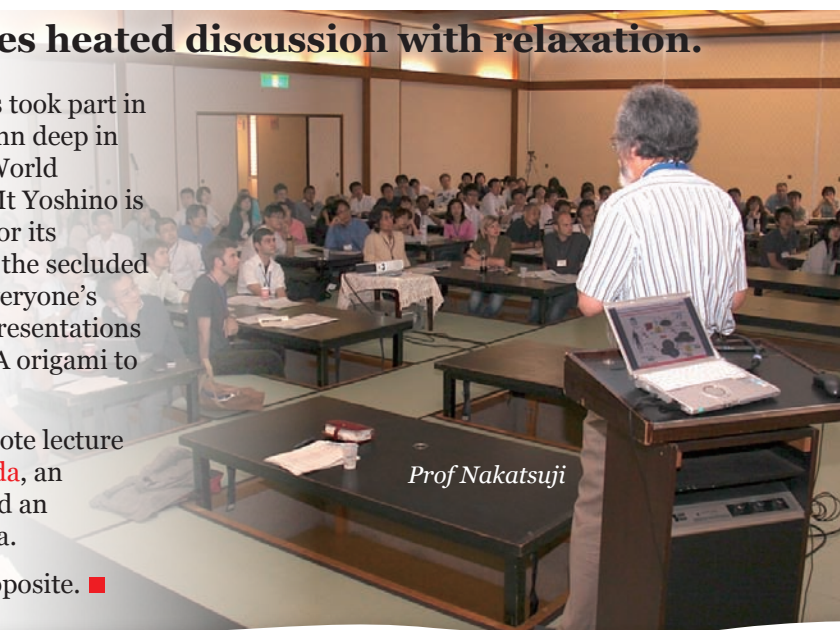
Science and Serenity in Yoshino

3rd retreat, to Nara, mixes heated discussion with relaxation.

A record number of institute researchers took part in the two-day event, held at a traditional inn deep in the mountains of Nara Prefecture. The World Heritage-designated area surrounding Mt Yoshino is renowned for its cherry trees as well as for its numerous temples and sacred sites, and the secluded locale proved to be ideal for focussing everyone's attention on the dozens of posters and presentations on topics ranging from stem cells to DNA origami to porous materials.

Highlights of the retreat included a keynote lecture by Osaka University Prof **Toshio Yanagida**, an evening world map creation exercise, and an excursion tour to famous sites in the area.

Additional photos appear on the page opposite. ■





Posters...

...posters...

...posters...

Rush for coffee...

...and slippers.

...posters...

...and slippers.

...have you been?

...in the world...

(SCG's Adj Assoc Prof Kato)

Prof Yanagida

Challenges and ...

- Discovery, 発見
- Wonder, 驚き
- Passion, 感動

Sports and arts have the power to move people emotionally. Even in the natural sciences, similar effects can be seen in reactions to revelations from mathematics or astronomy. It is in our power as chemists to unlock mysteries that likewise inspire findings of wonder and passion. We must strive to uncover facts that turn conventional wisdom on its head and create a new chemistry.

Prof Kitagawa

3rd iCeMS Retreat
Chikurin-in Gumpôen
Yoshino, Nara
Sept 30–Oct 1, 2011

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Kyoto SMI: Outreach to Gov't and Industry

Nonprofit organization **Kyoto SMI** (“Smart Materials and Innovation”), founded with the mission of bringing the fruits of iCeMS research to industry and society, recently held its second outreach seminar at the Tokyo offices of Kyoto University.

Attracting over 70 representatives from government and industry, the seminar highlighted the work of **Susumu Kitagawa**, iCeMS Professor and Deputy Director, who together with his team of researchers is leading the world in the development of porous materials for storage, separation, and transformation of gaseous substances. One example of this research is illustrated in the joint work with Dr **Takashi Uemura**, as described on page one.

This most recent seminar, held on September 26, included presentations by Mr **Masaki Matsuda**,

Deputy Director in the METI Chemicals Division, Dr **Hiroshi Kajiro**, senior scientist in the Advanced Technology Research Laboratories of Nippon Steel Corporation, together with Prof Kitagawa and four of the top scientists from the Kitagawa Lab. Kyoto SMI Chief Director **Tsuneo Nakahara**, Honorary Chairman of the Engineering Academy of Japan and former Vice President of Sumitomo Electric Industries Ltd, also spoke at the event.

The first Kyoto SMI seminar, held in Tokyo in February, focussed on innovative applications of stem cell research to regenerative medicine. iCeMS Associate Professor and head of the Innovation Management Group (IMG), Dr **Shintaro Sengoku**, directs cross-sector efforts at the iCeMS and also serves on the Kyoto SMI board. ■



*Clockwise from upper left: Kyoto SMI Deputy Chief Director and Mitsubishi Electric Corporate Advisor **Katsuhiro Tsukamoto**, Dr Sengoku, Mr Matsuda, Prof Kitagawa, Dr Kajiro, Dr Nakahara, and Kitagawa Lab members Drs **Takashi Uemura**, **Stephane Diring**, **Satoshi Horike**, and **Takafumi Ueno**.*

Hands-On Science Classrooms: High Schoolers Explore Brownian Motion



Looking under a microscope, you can see what appear to be many tiny creatures moving about. But just because these are moving, does that mean that they are actually alive?

This and other questions related to Brownian motion are being addressed this year in a series of hands-on science classroom events for high school students, educators, and the public, jointly sponsored by the iCeMS Science Communication Group (SCG) and Kyoto University's **Center for iPS Cell Research and Application (CiRA)**, including help from the **Kyoto**

University of Art and Design and Olympus Corporation.

In addition to science, the sessions also focus on sound-based audience participation (photo at page bottom). "Shall We Buruburu?" events oriented toward the general public held in June expanded on this performance aspect, including contributions from sound artist **Akio Suzuki**.

More information on the iCeMS' science communication program is available on our website. ■



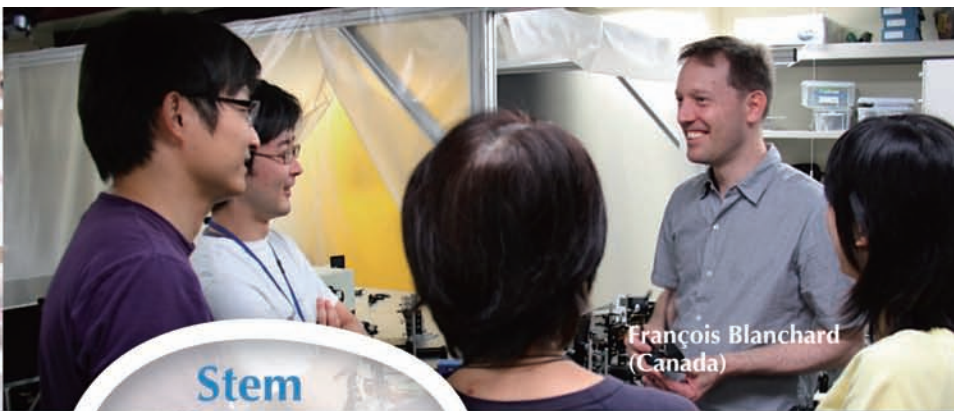
Speakers at the October 3 classroom event with Rakusai High School included (page top right) iCeMS Science Communication Group Asst Prof **Kei Kano**, (above from left) SCG Research Associate **Eri Mizumachi**, **Ryo Kitano** and **Yosuke Nakayama** of the Kyoto University of Art and Design, and iCeMS Sen Lec **Hiroaki Yokota**.



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Yuliya Orlova
(Ukraine)



Francois Blanchard
(Canada)

Stem
cells together with
mesoscopic
sciences.



Liis Seimberg (Estonia)



Franklin Kim (USA)
iCeMS Kyoto Fellow

Combining
physics, chemistry,
and cell biology.




Ziya Kalay (Turkey)
iCeMS Kyoto Fellow

Join us
at the iCeMS in
Kyoto to create a
new science.



Peter Carlton (USA)
iCeMS Kyoto Fellow

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Sayako Matsui
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Pavel Hejcik
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The **WPI program** was founded in 2007 at the initiative of Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) with the aim of establishing and operating a network of world-class scientific research centers.

Kyoto University's iCeMS is one of six institutes in this program.
For details see www.jsps.go.jp/english/e-toplevel/