

The research funding program, Exploratory Research for Advanced Technology (ERATO), was founded in 1981 to promote basic research in science and technology. In 2002, ERATO received a complete makeover under the larger umbrella of the Strategic Basic Research Programs initiated by the Japanese government. The goal of the Strategic Basic Research Programs is to promote problem resolution-oriented basic research, which is guided by strategies set by the government based on the social and economic needs of the society, as well as the national policy on science and technology.

ERATO projects aim to achieve national strategic sectors. The Japan Science and Technology Agency (JST) establishes key research areas which have a high potential to create seeds for new technologies. It then appoints a research director (from academia or industry) to be responsible for each of these strategic research areas. Currently, three cutting-edge ERATO projects are being led by researchers at Kyoto University. Two of three projects are showing below.



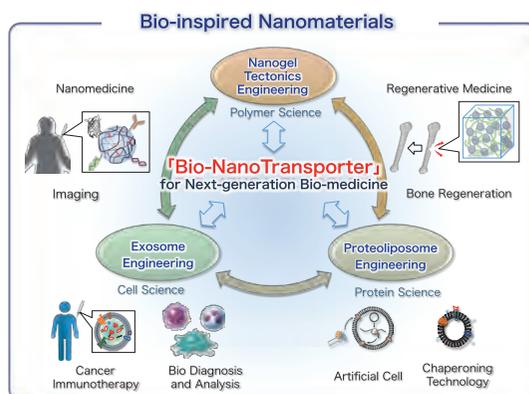
## AKIYOSHI Bio-Nanotransporter Project

Research Director:  
Professor Kazunari Akiyoshi,  
Graduate school of Engineering

This project establishes a new strategy for preparation of bio-inspired functional nano particles and nano particle-based “bottom-up” design of biomaterials (functional gels or bio-interfaces) for advanced medical technology.

In particular, the members of the research team led by Prof. Akiyoshi focus on the development of new cancer therapies, vaccines and tissue engineering (bone regeneration) through use of new biomaterials.

[www.jst.go.jp/erato/akiyoshi/](http://www.jst.go.jp/erato/akiyoshi/)



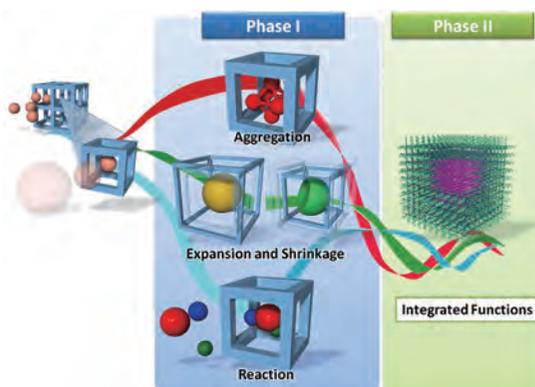
## KITAGAWA Integrated Pores Project

Research Director:  
Professor Susumu Kitagawa,  
Institute for Integrated Cell-Material Sciences

The aim of this project is to establish a symbiotic integration of porous materials and porous functions; hence, to develop porous coordination polymers (PCPs) with controllable and flexible performance responsive to target environments.

These environments range in size from the intermolecular or interatomic distances of the pores of materials (0.1-10 nm) up to the space inside biological cells (100 nm). Nonlinear, cooperative events taking place in mesospace present challenging problems and may hold the key to the technologies of tomorrow.

[www.jst.go.jp/erato/kitagawa/](http://www.jst.go.jp/erato/kitagawa/)



The Ninety-sixth Council for Science and Technology Policy selected a total of 329 researchers and research projects for its Funding Program for Next Generation World-Leading Researchers (NEXT Program), including thirty-six from Kyoto University. The program was established by the Ninety-sixth Council for Science and Technology Policy with the aim of supporting the research of young, female or local researchers who are expected to be future world leaders in the field of science and technology, and promoting “green” and “life” innovations, as set forth in the New Growth Strategy.

[www.jsps.go.jp/english/e-jisedai/index.html](http://www.jsps.go.jp/english/e-jisedai/index.html)

## Green Innovation

Researcher	Project Title
ONO Teruo (Professor, Institute for Chemical Research)	Development of low-energy-consumption next generation devices using current-induced spin dynamics
KAWAI Shigeyuki (Assistant Professor, Graduate School of Agriculture)	Establishment of the practical ethanol-production system from marine biomass by utilizing the bacterium with regulated oxidation-reduction system
KUDOH Hiroshi (Professor, Center for Ecological Research)	Functional dissection and prediction of plant climate response by seasonal gene expression analysis
KOBAYASHI Kensuke (Associate Professor, Institute for Chemical Research)	Nonequilibrium many-body dynamics in solid state devices
TERAO Jun (Associate Professor, Graduate School of Engineering)	Manufacture of next generation type nanoscaled electronics devices by methodology of synthetic chemistry
TOJU Hirokazu (Assistant Professor, Young Researcher Development Center)	Metagenomic analysis of underground ecosystems as a basis for restoration ecology
NAGAO Yuki (JST PRESTO Researcher, Graduate School of Science)	Creation of nanoproteomics fuel cell
NAKAMURA Masaharu (Professor, Institute for Chemical Research)	Development of selective organic synthesis based on iron catalysis
NISHIMURA Yoshiki (Assistant Professor, Graduate School of Science)	Exploring the basis of systematic gene expressions and maternal inheritance of chloroplasts
MATSUDA Kenji (Professor, Graduate School of Engineering)	Nanoscience of switching molecule for ultimate energy-saving device
WATANABE Yumiko (Assistant Professor, Graduate School of Science)	Paleoclimate study based on high time resolution analyses of stalagmites

## Life Innovation

Researcher	Project Title
ADACHI Taiji (Professor, Institute for Frontier Medical Sciences)	Biomechanics of structural and functional adaptation of living systems
UESUGI Motonari (Professor, Institute for Integrated Cell-Material Sciences)	Control and analysis of cells by synthetic small molecules
UENO Takafumi (Associate Professor, Institute for Integrated Cell-Material Sciences)	Design of biosynthetic materials for control of cell functions with biogas molecules
EBISUYA Miki (Assistant Professor, Graduate School of Medicine)	Synthetic biology approaches to new understandings of gene expression network
OKUNO Yasushi (Professor, Graduate School of Pharmaceutical Sciences)	Computational drug design technologies to innovate pharmaceutical development

## Life Innovation

Researcher	Project Title
ONO Masahiro (Associate Professor, Graduate School of Pharmaceutical Sciences)	Development of next generation molecular imaging probes for diagnosis and therapy of Alzheimer's disease
KAKEYA Hideaki (Professor, Graduate School of Pharmaceutical Sciences)	Frontier research for natural products-based chemical biology toward molecular target drugs discovery
KABASHIMA Kenji (Associate Professor, Graduate School of Medicine)	Role of skin in systemic immune and allergic systems
KAWAGUCHI Yoshiya (Senior Lecturer, Graduate School of Medicine)	Mechanism in the maintenance of adult progenitors of liver and pancreas, and mouse models with disturbed progenitor cell system
KENGAKE Mineko (Associate Professor, Institute for Integrated Cell-Material Sciences)	Mechanisms underlying the critical period plasticity of dendrite arborization and neural circuit formation
SATO Wataru (Associate Professor, Young Researcher Development Center)	Integrated exploration for psychological and neural mechanisms underlying social interaction impairment in pervasive developmental disorder
SHINOHARA Mito (Assistant Professor, Graduate School of Medicine)	Molecular analysis of spermatogonial stem cell behavior in homing to stem cell niche
SENGOKU Shintaro (Associate Professor, Institute for Integrated Cell-Material Sciences)	Integrative innovation management research, human resources development, and support for commercialization in the stem cell science and technology sphere
TACHIBANA Makoto (Associate Professor, Institute for Virus Research)	Studies about structure and maintenance of sex-specific mammalian epigenome
DOI Masao (Senior Lecturer, Graduate School of Pharmaceutical Sciences)	Research and development of innovative chronotherapy and diagnosis based on biological clock
TOMONAGA Keizo (Professor, Institute for Virus Research)	Development of a novel RNA virus vector platform for small RNA therapies
TOYOSHIMA Fumiko (Professor, Institute for Virus Research)	The control mechanism of cell division axis and its role in the morphogenesis and maintenance of mammalian skin
NAKAMURA Kazuhiro (Assistant Professor, Graduate School of Medicine)	Elucidation of brain circuitry mechanism for emotion-autonomic signaling to conquer stress disorders
HARADA Hiroshi (Senior Lecturer, Graduate School of Medicine)	Analyses of localization and dynamics of radioresistant cancer cells and development of imaging probes to monitor tumor radioresistance
HARADA Yoshie (Professor, Institute for Integrated Cell-Material Sciences)	Development of a novel single-molecule imaging technique using fluorescent diamond nanoparticles and its application to biomolecule observation
MASUDA Satohiro (Senior Lecturer, Graduate School of Medicine)	Discovery of biomarkers for graft liver injury
MATSUMOTO Masayuki (Assistant Professor, Primate Research Institute)	Neural mechanisms underlying motivation: roles of dopaminergic signals to the prefrontal cortex
YANAGITA Motoko (Associate Professor, Young Researcher Development Center)	Identification and regulation of the cells responsible for fibrosis, hormone secretion, and regeneration during chronic kidney diseases
YAMADA Masumi (Assistant Professor, Pioneering Research Unit for Next Generation)	Development of a practical early warning system for earthquakes in Nankai trough
YOSHIMURA Shigehiro (Associate Professor, Graduate School of Biostudies)	Development of molecular delivery system to the cell nucleus using amphiphilic peptide



## Institute for Integrated Cell-Material Sciences (iCeMS)



- Launched in 2007 as part of the WPI, a MEXT initiative
- One of six forefront research institutes nationwide
- Led by **Norio Nakatsuji**, Japan's human ES cell pioneer
- **Susumu Kitagawa**, **Shinya Yamanaka**, and others on staff

**pathmaking science**

- Combining cell biology, chemistry, and physics
- Investigating multimolecular structures within cells and artificial materials
- International research groups
- Ample opportunities for young scientists to innovate
- Work leading to innovations in medicine, pharmaceuticals, the environment, and industry



**global outlook**

- Active partnerships with a wide range of influential international research institutions
- Sponsoring joint symposia, short and long term researcher exchanges, and satellite labs
- New journal, *Biomaterials Science*, launched with the Royal Society of Chemistry (UK), incl. **Nakatsuji** as an Editor-in-Chief and iCeMS PI **Hiroshi Sugiyama** as an Assoc. Ed.

**Photos:** Welcoming the NCBS director (above right) and attending joint symposia at Heidelberg University (lower left, July 2011) and Beijing, China (April 2012).



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[www.icems.kyoto-u.ac.jp](http://www.icems.kyoto-u.ac.jp)



## Center for iPS Cell Research and Application (CiRA)

The Center for iPS Cell Research and Application (CiRA) was established in April 2010 as the world's first institute focusing on induced pluripotent stem cells (iPS cells). Professor Shinya Yamanaka, who pioneered the research field of iPS cell technology, leads the institute as director.

Equipped with a cell processing facility and laboratory animal research facilities, CiRA is comprised of four research departments: Reprogramming Science, Cell Growth and Differentiation, Clinical Application and Regulatory Science. Twenty-seven principal investigators work here to develop medical and pharmaceutical applications for iPS cells.

[www.cira.kyoto-u.ac.jp/e/](http://www.cira.kyoto-u.ac.jp/e/)

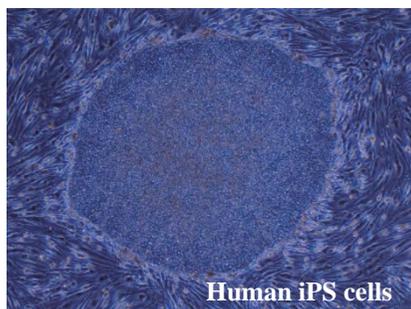


Director  
Shinya Yamanaka

### New Topics at CiRA

#### ◆CiRA International Symposium 2012

CiRA held its 1st international symposium in February 2012, with six leading scientists from the U.K., the U.S. and Japan sharing their latest research data and insight into embryonic stem cells, iPS cells and direct reprogramming with approximately 270 participants. CiRA plans to hold a second symposium in March 2013.



#### ◆Third Patent Granted in the United States

Kyoto University was granted its third patent related to the iPS cell generation by the U.S. Patent and Trade Office on March 6, 2012, following its first U.S. two patents, which were granted last year. The university also has iPS cell patents in Japan and Europe. CiRA's Legal Affairs and IP Office plays a central role in the management of iPS cell patents.

### CiRA's Goals for the Next Decade

- Establish basic technologies and secure intellectual properties.
- Establish iPS cell stock for use in regenerative medicine.
- Conduct preclinical and clinical studies on priority diseases.
- Develop new drugs using patient-derived iPS cells.





## Kyoto University Research Administration Office (KURA)

As part of a new national government initiative, the Kyoto University Research Administration Office (KURA) was officially launched in April 2012 as an organization to provide consistent research support for project planning, obtaining research funds, project execution and public relations. KURA is intended to ease the non-research related burden (such as administrative work) imposed on researchers by providing a well-organized research support network. To achieve that aim, KURA networks and collaborates with existing research support offices at Kyoto University.

[www.kura.kyoto-u.ac.jp/en/](http://www.kura.kyoto-u.ac.jp/en/)

### Vision

To contribute to the generation of world-class knowledge by collaborating with researchers in accordance with Kyoto University's mission, and to be a pioneering model for university research administration in Japan.

### Mission

#### ■ Facilitating research activities

To support the development of an infrastructure for research promotion utilizing diverse research resources at Kyoto University.

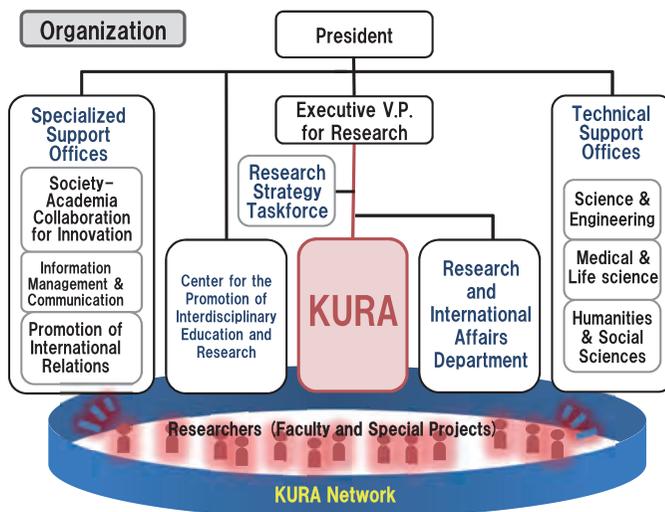
To create a support system to obtain external research funds.

#### ■ Disseminating research achievements to society

To form a hub for mutual communication between researchers and society.

#### ■ Creating an infrastructure for effective support

To create a research administration network which resonates with the diverse members and fields of knowledge at Kyoto University.



KURA collaborates with the faculties, institutes and research centers of Kyoto University, as well as with external national and international research organizations, including those in the private sector. Through these activities, KURA aims to form a robust prototype for an effective university research administration system—a concept which is not currently well recognized in Japan, and to develop training programs for university research administrators.

As of April 1, 2012, the KURA staff consists of three senior research administrators, five research administrators and three administrators. The office is located on the Yoshida Campus.

*Photo:* The KURA staff with President Hiroshi Matsumoto [4<sup>th</sup> from left] and Executive V.P. Kiyoshi Yoshikawa [3<sup>rd</sup> from left]



## Hakubi Project

The *Hakubi* Project welcomes applications from researchers all over the world regardless of the applicant's nationality. It is a project to support young researchers in any range of basic and applied studies in all academic fields. The following are introductions to recent research activities produced by two *Hakubi* researchers.

### Closing the Regional Human Rights Gap in Asia: The Future of the Asia Pacific Forum

Assistant Professor Silvia Croydon - Hakubi Center, Graduate School of Law



Asia is the sole region where there is neither an inter-governmental human rights court or commission, nor a human rights treaty. Indeed, whilst each of the other major areas of the globe—Europe, the Americas, the Arab Peninsula and Africa—has equipped itself with a system for human rights protection and promotion consisting of a set of such institutions, Asia stands lacking one. This vacuum, which affects as many as two thirds of the globe's inhabitants, for it is this many people that call Asia home, is often said to be one of the most notable aspects of today's international human rights regime.

Assistant Prof. Silvia Croydon, who has previously undertaken research relating to prisoners' rights in Japan and jury and quasi-jury systems introduction in East Asia, is approaching this question of human rights protection in Asia from a fresh perspective. Rather than focusing, as scholars have hitherto done, on the inter-governmental level, she places the spotlight on the unique and relatively new institution going by the name of the Asia Pacific Forum of National Human Rights Institutions, and seeks to highlight that regional human rights mechanisms alternative in type to those already observed elsewhere might also be possible. Her exploration of the Forum's potential to fill the regional void involves an assessment of the progress in Japan, Taiwan and China—arguably the three key Asian players—towards installing independent National Human Rights Institutions.

### Automated Programs Generation for Supercomputers

Assistant Professor Takayuki Muranushi – Hakubi Center, Department of Physics



As today's computers become increasingly high-performance, particularly with regards to parallel computers, their programs become longer and programming becomes an increasingly challenging and error-prone task for simulation scientists. Assistant Prof. Takayuki Muranushi, a student studying astrophysics, dreamt of automating this task. Mr. Muranushi was selected for the *Hakubi* Project, and the freedom to conduct research afforded by the project enabled him to develop Paraiso, a language to describe partial differential equation solvers in mathematical notation, as well as various kinds of numerical simulation techniques. The process of combining and multiplying these techniques to produce an actual program is now automated. Moreover, Paraiso can improve programs by using evolutionary computation. It generates literally millions of different implementations by means of mutations and crossovers, and searches for better ones. The accomplishments of Paraiso were reported in the journal *Computational Science and Discovery* (Muranushi, 2012, Vol. 5, 015003).

Mr. Muranushi is now seeking to use the new technology to help those working in his own field of astrophysics, and the Hakubi Center has also offered him the unprecedented opportunity of collaborating with engineers and environmental biologists. He works together with computer scientists to improve Paraiso, and make the still young language more reliable and practical, at the same time as working to complete his PhD. Mr. Muranushi is a perfect example of how the Hakubi Project can foster student's innovation in unexpected areas.



#### ■ What is the *Hakubi* Project? How do I apply?

The term, *Hakubi*, literally means “white eyebrows” in Japanese. The project is named after a legend in *Shu* (蜀), one of the states of Three Kingdoms era in ancient China. According to the legend, in the kingdom lived five brothers with extraordinary talents. Since the fourth brother, who was particularly outstanding, had white hairs in his eyebrows, the term *Hakubi* has come to refer to the most prominent individuals. The call for application for the fifth intake will open in March, 2013.

■ For further information: [www.hakubi.kyoto-u.ac.jp/eng](http://www.hakubi.kyoto-u.ac.jp/eng)

## Tachibana Award – for the Most Outstanding Female Researchers at Kyoto University

Kyoto University established the award in 2008, as a system to acknowledge the outstanding research achievements of young women researchers at Kyoto University in the fields of humanities, social sciences, and natural sciences. By publicly honoring researchers who have made excellent accomplishments in their research, the award aims to further motivate them, as well as future generations of women researchers following in their path, to contribute to the diversity of scientific research not only at Kyoto University but throughout Japan and the world.

[www.kyoto-u.ac.jp/en/news\\_data/h/h1/news7/2012/120209\\_1.htm](http://www.kyoto-u.ac.jp/en/news_data/h/h1/news7/2012/120209_1.htm)

### Award Winners 2011



**Ecological interaction networks triggered by plant volatiles**  
Assistant Professor Kaori Shiojiri - Hakubi Center for Advanced Research



When plants are damaged, they release volatiles called induced plant volatiles. Dr. Kaori Shiojiri has been studying the way and extent to which induced plant volatiles affect biological communities.

Her findings indicate that they affect the distribution of both herbivore and predator insects, the diurnal and nocturnal behaviors of some insects, and communication between plants. Based on her research, Dr. Shiojiri proposes that induced plant volatiles are important in creating and to maintaining biological diversity. Her goal is to clarify both the mechanism and sustainability of biological diversity. She is exploring the possible applications of her findings, particularly agricultural applications, such as using induced plant volatiles to reduce the need for pesticides and herbicides.

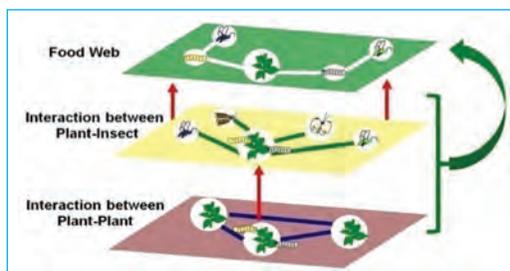


Fig. 1) Food web in supported by two layers which interacts among living things through induced plant volatiles.



**Study on quantum link invariants using universal invariants**  
Doctoral Student, Sakie Suzuki - Graduate School of Science



### ■ Origins of the Tachibana Award's Name

The Tachibana, an evergreen citrus tree indigenous to Japan, has been highly valued since ancient times as a symbol of eternity, and is often a motif in traditional family crests. The Japanese Order of Culture is also designed in the image of the five cyclic petals of the flower, likening the qualities of the evergreen with the longevity of culture. Named with these images in mind, the Tachibana Award is conferred in the hopes that the scientific activities of the outstanding female researchers who receive it will remain resilient.



**Award Winners 2008-2010**  
[left to right]  
Ms. Sachiko Honjo and Assoc. Prof. Yoshiko En'yo,  
Ms. Hiroko Watanabe and Assoc. Prof. Asli M. Colpan  
with Executive V.P. Yoshikawa,  
Assoc. Prof. Youko Hamazaki  
and Ms. Kyoko Kitamura with  
President Matsumoto