FY 2009 WPI Project Progress Report
World Premier International Research Center (WPI) Initiative

Host Institution	Kyoto University	Host Institution Head	Hiroshi Matsumoto
Research Center	Institute for Integrated Cell-Material Sciences (iCeMS)	Center Director	Norio Nakatsuji

Summary of center project progress

1. Institute Organization

FY 2009 has been marked by the establishment of the new Center for iPS Cell Research and Application (CiRA), a strengthening of the stem cell research faculty at the iCeMS, an expanded presence for the Center for Meso-Bio Single-Molecule Imaging (CeMI), a new Administrative Director with a strong background in academia, and the implementation of a roadmap for international recruitment of top researchers.

2. Promotion of Cross-Disciplinary Research and Exchange

(1) Successes in promoting cross-disciplinary research include: streamlining the Institute's research objectives to two domains, initiating and accelerating 28 collaborative projects, Exploratory Research Grants to junior investigators, the regular hosting of iCeMS Seminars and International Symposia, and an orientation seminar for younger researchers seeking external grants.
(2) Successes in cross-disciplinary exchange include: the first overnight retreat for researchers, regular cross-disciplinary discussion meetings, and management of collaboration and private-public sector linkage initiatives supported by the newly formed Innovation Management Group.

3. Internationalization

Active recruitment plans targeting overseas researchers have accelerated internationalization, raising the total number of foreign scientists to 46 (over 30%) by the end of FY2009. Also notable are the hiring of new iCeMS Kyoto Fellows and the recruitment of prominent visiting faculty from overseas, the official opening of the **Heuser** Lab, plans for overseas training for young researchers, as well as the establishment of the Overseas Researchers Support Office. Exchanges with overseas partner institutes have been significantly increased with mutual visits and research collaboration by key researchers and an MoU signed with UCLA and others planned.

4. Research Milestones and Awards

Notable research successes include Prof **Yamanaka**'s receipt of the Lasker Award, the selection of Prof **Yamanaka**'s advanced research program for inclusion in the government's "Funding Program for World-Leading Innovative R&D on Science and Technology," Thomson Reuters' announcement of Prof **Kitagawa**'s work as having had the highest impact on his field, the international media coverage of Prof **Uesugi**'s study on a chemical compound that cuts off fat-making genes, Prof **Takano**'s paper on the cover of *Nature Chemistry*, and additional highly significant research findings published in leading journals by Profs **Yamanaka**, **Kitagawa**, **Nakatsuji**, **Harada**, and others.

5. Buildings and Facilities

Significant improvements were realized in the facilities of the Institute with the completion and opening of the main building, the opening of the Gifu University satellite research facility, and the completion of the CiRA research building. Key large scale laboratory equipment has been installed and become available for shared use, and the Chemical Screening Center for chemical biology research has also been established.

6. Outreach

Major outreach initiatives have included the iCeMS Café series, a hands-on research classroom for high school students, a public symposium on iPS cell research, and a public lecture in Gifu. In addition, a biweekly lunch time Integrity Reading Club for promoting research integrity has started, further expanding informal exchanges among researchers in the iCeMS.

7. Response to the WPI Program Committee's Comments

A number of important actions have been taken, most notably: the streamlining of the Institute's research objectives, the leadership displayed by the University President and the Institute Director in initiating the establishment of the CiRA as a new institute focused on translational research and clinical application of iPS cells (maintaining basic research of iPS cells at the iCeMS), and the implementation of a recruitment roadmap for foreign scientists with an aim to further internationalization, as well as the promotion of cross-disciplinary research collaboration.

1. Summary of center project

<Initial plan>

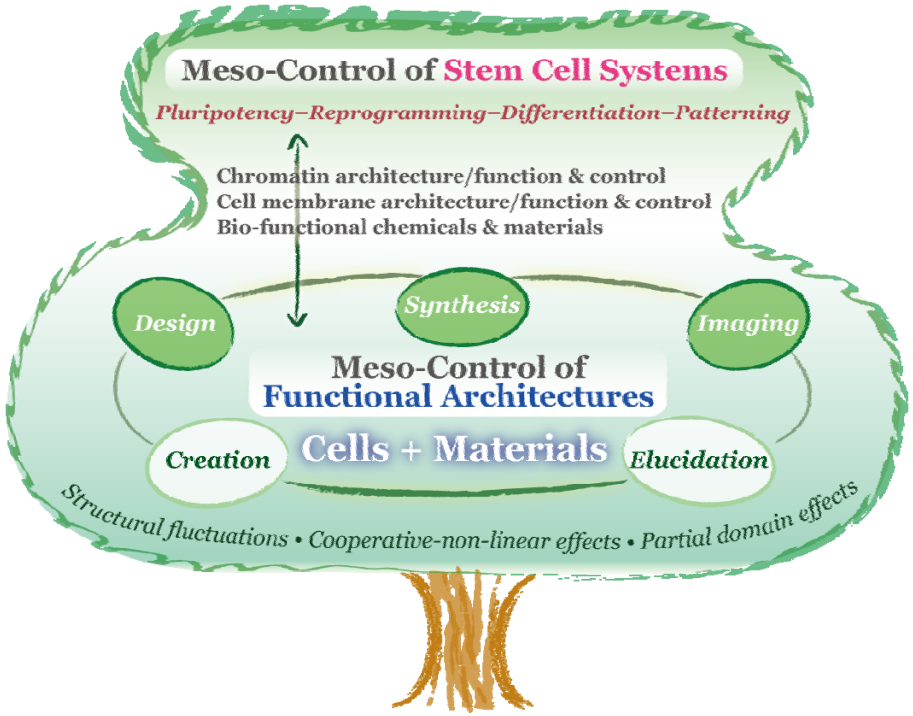
We will accumulate a critical mass of leading scientists for the symbiotic integration of material and cell sciences (focusing on mouse and monkey pluripotent stem cells), based on the notion that the fundamental understanding and control of molecular complexes in the meso-scale of 10-100 nm is critical for creating the science and technology of the next generation. We will achieve this goal by taking cross-disciplinary approaches, with the following inter-related targets. For basic science:
1) New Chemistry/Physics of Meso-Space 2) Cellular meso-biophysics; and 3) Stem-cell-differentiation meso-engineering. We will contribute to human wellness by developing A) environmentally-friendly chemical reaction systems, by developing new methods of material conversion (chemical reaction), separation, and storage B) drug-synthesis/controlled-release microvessels working in the body, and C) regenerative medicine based on regulated cell-material complexes.

<Results/progress/alternations from initial plan>

1. Clarifying research objectives / Progress toward cross-disciplinary research

Responding to official WPI Program Committee comments on the FY 2008 Progress Report, as well as to advice received subsequently from the PD and PO, the iCeMS Director decided after extensive deliberation with the PIs to refine the institute's research objectives, making them clearer and easier to grasp for outside observers. The new objectives are:
Domain A: Meso-Control of Stem Cell Systems
Domain B: Meso-Control of Functional Architectures

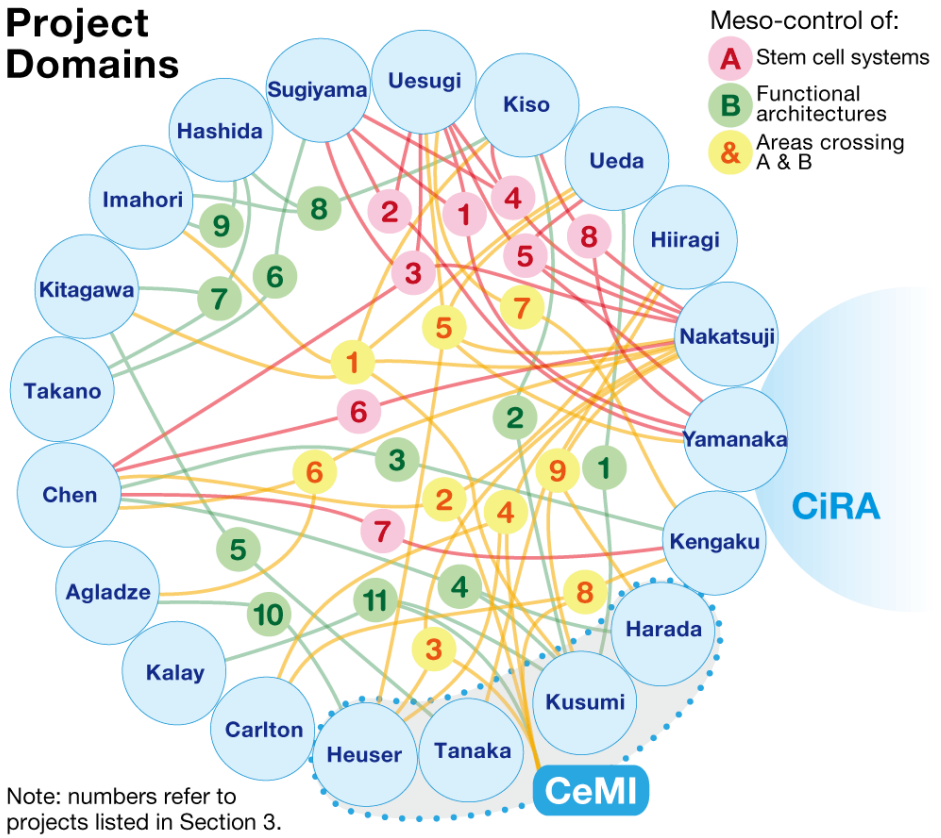
A conceptual diagram is shown below.



Promotion of collaborative research projects

With this in mind, so far 28 collaborative research projects have already been proposed or are now in progress.

A diagram showing the collaboration network among labs:



See Section 3 for a full list of these collaboration projects.

2. Establishment of the new Center for iPS Cell Research and Application within Kyoto University

- In FY 2007, the iCeMS Director swiftly implemented his decision to create the Center for iPS Cell Research and Application (CiRA) under the auspices of the iCeMS, marking a major advance in the effort to apply human stem cell research to the field of regenerative medicine.

- Reflecting progress in the field as well as answering public expectations, clinical applications for regenerative medicine were added to the CiRA's mission on top of basic research. This change necessitated restructuring of the iCeMS-CiRA relationship because this new mission extends the CiRA's research areas beyond the scope of the WPI Program.

- Thanks to the strong leadership of Kyoto University's president as well as the iCeMS Director, working together to consolidate opinions on all levels, the process was started to make the CiRA a new institute within the university while simultaneously making a correspondingly high priority budget request to the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

- The resulting new institute is expected to be officially established on April 1, 2010, at which point it will be free to further develop clinical applications while maintaining its basic research arm within the iCeMS. Namely, Prof **Yamanaka** will continue his basic research on iPS cells as one of the PIs within the iCeMS and concurrently will manage the CiRA as its director.

- Strengthening the key role that iPS/stem cell-related basic research will play within the iCeMS, the following researchers have joined the staff: Asst Prof **Takuya Yamamoto** of the CiRA has been appointed as one of four new iCeMS Kyoto Fellows; Prof **Takashi Shinohara** of the Medical School (Kyoto University) joins the adjunct faculty and strengthens stem cell research with his study of germ cell lineage stem cells; and Prof **Mitinori Saitou**, now also an adjunct professor, brings his expertise in fate determination and differentiation mechanisms of stem cells in early embryos. Also, Prof **Azim Surani**, a world leading scientist in the germ/stem cell lineage and epigenetic reprogramming research and a professor at Cambridge University's Gurdon Institute, has taken up a visiting professor post at the iCeMS.

<u>3. Improvements to the research environment</u>

- A world leader in the development of electron microscopy and cell biology research, Prof **John Heuser** has established a new research lab within the iCeMS in FY 2009, including the installation of high-spec electron microscopes and the hiring of necessary lab faculty and staff. Prof **Heuser** himself begins work at a 20% effort level.

	• The Center for Meso-Bio Single-Molecule Imaging (CeMI), established in FY 2008, hired a faculty scientist in a managerial role in FY 2009 and took concrete steps toward allowing for shared use of equipment among iCeMS (and non-iCeMS) researchers. • The Chemical Screening Center was created in the main building of the iCeMS in FY 2009, in order to actively expand research in chemical biology. <u>4. Initiatives to recruit and foster faculty and staff</u> • The implementation of a roadmap for faculty and staff recruitment has raised the number of foreign researchers to 46 (over 30% of the total) as of March 31, 2010. • In order to accelerate internationalization and cross-disciplinary research at the Institute, 17 researcher positions were created exclusively for foreign researchers under the iCeMS Director's initiative, as part of a continuing effort. • An international effort to recruit young, promising researchers for the new iCeMS Kyoto Fellow positions attracted over 30 applicants, two of whom were selected from overseas for a total of four new Fellows. These scientists will establish independent research groups on par with the PIs, receiving sufficient work space and startup funds to pursue cross-disciplinary and collaborative research projects. • 77 iCeMS researchers took part in an offsite retreat. The two days of lectures, poster presentations, and lively, informal discussion will certainly promote increased cross-disciplinary research collaboration.

2. Research fields

<Initial plan>

An interdisciplinary research field, spanning Biosciences, Chemistry, Material Sciences, and Physics (selected from the provided list of fields).

The scientific direction of this proposed Institute was conceived based on TWO KEY CONCEPTS. They are MESO-SPACE and STEM CELLS.

(1) Meso-space is the space of 10-100 nm. Between the two well-walked lands of bulk- and nano-spaces, there is the vast unexplored field of meso-space. However, we can find fledgling developments there in various branches of science. The cooperative structural changes of porous coordination polymers present good examples. Many key functions of the cell, such as transcription (mRNA synthesis using a DNA template) and signaling, are achieved by large molecular complexes of 10-100 nm, rather than simple bimolecular collisions. In this Institute, we will develop a fundamental understanding and control of the key molecular (weakly cooperative) interactions occurring in the meso-space, throughout cellular, chemical, physical, and materials sciences. By taking interdisciplinary approaches, we will establish a unified view of the molecular interactions in the meso-space in all of these fields, and will develop a variety of unprecedented technologies based on the meso-scale interactions.

(2) Mouse and monkey pluripotent STEM CELLS will be used as an important paradigm of the cell throughout the research in this Institute. A unified cellular paradigm is critical for fostering the collaborative research by investigators with various backgrounds. This would enable the application to regenerative medicine using human embryonic stem (ES) cells.

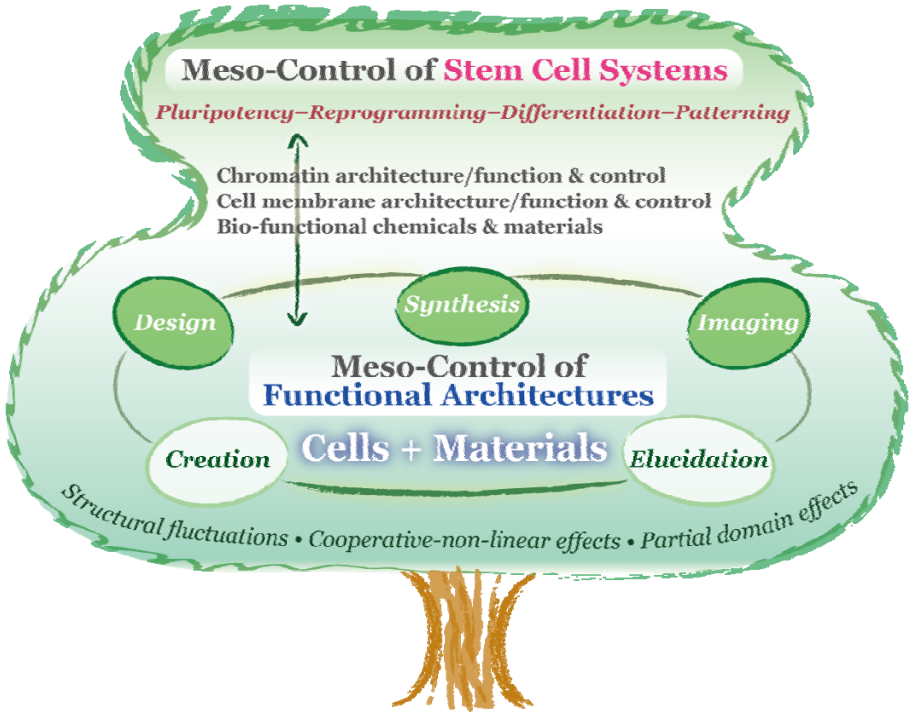
Kyoto University has been known worldwide for its excellence in both material and cell sciences. Physics and chemistry-related departments have produced four Nobel Laureates, and the times cited for Chemistry of Kyoto University was fourth in the world and first in Japan in 2006. Its Institute for Frontier Medical Sciences is a strong world leader in pluripotent stem cell research. Many faculty members of Kyoto University are active leaders in the forefront of such scientific integration, and thus will enable a critical mass of researchers to establish an ideal research environment.

<Results/progress/alternations from initial plan>

Based on guidance from the PD and PO and subsequent extensive discussions at the PI meetings, the Institute's research objectives have been reorganized into the following:

A) Meso-control of stem cell systems

B) Meso-control of functional architectures

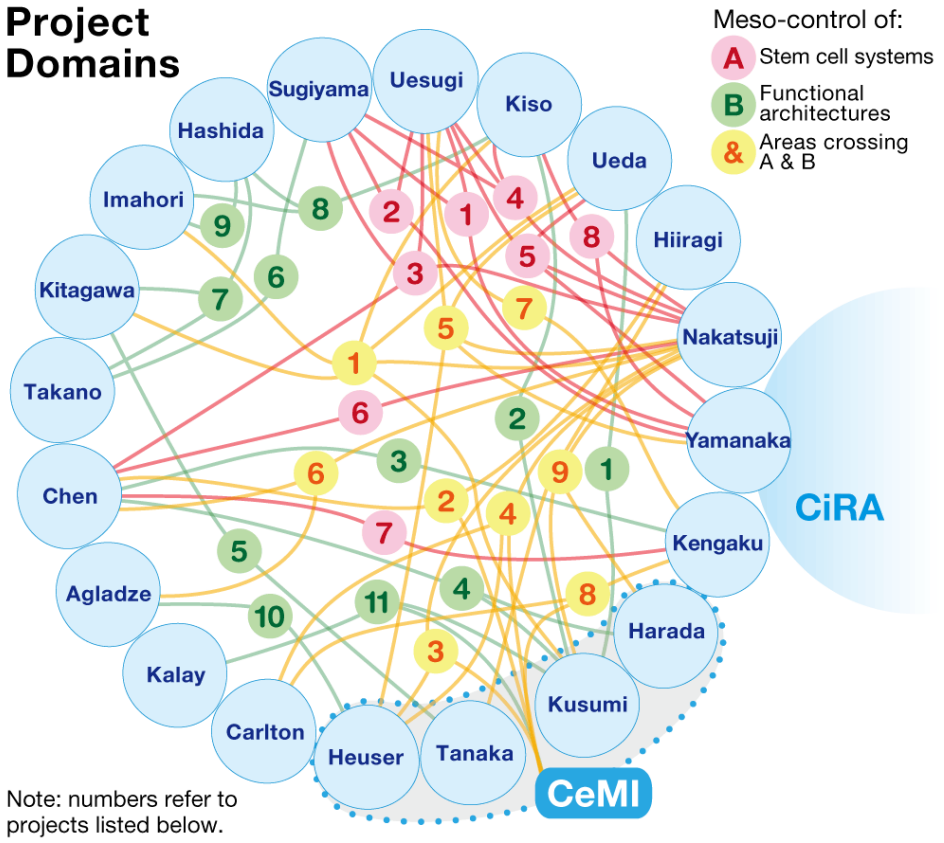


3. Research objectives

<Initial plan>
The same as those described in the “Project Summary” and “Research fields”

<Results/progress/alternations from initial plan>
A clarified initial plan for cross-disciplinary research is being implemented, with the following 28 collaborative research projects proposed and in progress. (Some projects are not described for proprietary reasons.)

The Director is also vigorously supporting 13 cross-disciplinary collaborative research projects by giving Exploratory Grants to junior investigators in an effort to initiate and further promote seamless progress in cross-disciplinary research.



Domain A: Meso-Control of Stem Cell Systems

1. iPS cell production by reprogramming with synthetic chemical compounds (**Yamanaka, Uesugi, Sugiyama**)

	2. Chemical compounds for pluripotency probes and other tools of iPS cell research (**Yamanaka, Uesugi, Sugiyama**) 3. Synthetic artificial transcription factors for stem cell control such as pluripotency maintenance and differentiation into specific cell lineages (**Nakatsuji, Sugiyama, Uesugi, Chen**) 4. Chemical library screening of synthetic small molecules for differentiation of ES/iPS cells (**Nakatsuji, Uesugi, Sugiyama, Kiso**) 5. Chemical screening to control ABC proteins in stem cells and differentiated cells (**Ueda, Uesugi, Nakatsuji, Yamanaka**) 6. Stem cell culture and patterning/differentiation by nanofibers and chemical doping (**Chen, Nakatsuji**) 7. Neural cell patterning on meso/micro-fabricated surfaces (**Chen, Kengaku**) 8. Glycobiology for pluripotent stem cells (**Nakatsuji, Yamanaka, Kiso**) <u>Domain B: Meso-Control of Functional Architectures</u> 1. Single molecule observation of ABCA1 to elucidate relationship between function and dynamics of transporters on the cell membrane (**Ueda, Kusumi**) 3. Development of functional neuron chips for control of the neural network formation (**Chen, Kengaku**) 4. Development of microfluidic platforms and devices for single molecule imaging and measurements in the cells (**Chen, Kusumi, Harada**) 5. Photo-induced electron transfer in porous protein crystals (**Tanaka, Kitagawa**) 7. Encapsulation of magnetic nanoparticles in protein cages (**Kitagawa, Ueno, Takano, Hashida**) 8. Development of new carriers for drug delivery using carbon nanotubes and lyposomes functionalized by peptides and glyco-coating (**Hashida**, **Imahori**, **Kiso**) 9. Development of light-harvesting carbon nanomaterials for phototherapy and multifunctional quantum dots for cell tracing (**Imahori**, **Hashida**) 10. Functional and structural analysis of excited cardiomyocyte in meso-scale (**Agladze, Heuser**) 11. Investigating the effects of meso-scale compartments on the kinetics of bimolecular reactions in the plasma membrane (**Kalay, Kusumi, CeMI**

	groups) Domain A & B: Crossing areas of Domain A and B 2. Potential contribution of cellular geometry to the cell fate specification. Mechanical context will be applied to the embryo or the isolated cell culture using a micro-devise, in order to examine if geometrical information can drive the lineage specification. (**Hiiragi, Chen, CeMI groups**) 3. Creation of disease and other model cells for meso-imaging and analysis (**Nakatsuji, Heuser, CeMI groups**) 4. Visualization and analysis of chromatin and nucleus structures in pluripotent stem cells, differentiated somatic cells and the germ cell lineage (**Nakatsuji, Carlton, Heuser, CeMI groups, Shinohara**) 5. Analysis of the roles of ABC transporters in meso-domain formation on membranes and in physiological role in stem cells (**Ueda, Heuser, Kusumi, Nakatsuji, Uesugi, Yamanaka**) 6. Cardiac tissue anisotrophy analysis using stem cell-derived cardiomyocytes and light-sensitive functional materials (**Agladze, Nakatsuji, Chen**) 7. Visualization and analysis of the dynamics of dendritic arborization using novel chemical compounds (**Kengaku, Uesugi**) 8. Visualization and analysis of neural cell process and intracellular transport (**Kengaku, Carlton, CeMI groups**) 9. Terahertz microscopy of living tissue and cells for functional imaging (**Tanaka, Kusumi, Harada, Nakatsuji, Hiiragi**)

4. Management

<Initial plan> 1) Composition of administrative staff An Administrative Director and a Deputy-Director, together with an administrative staff (approximately 27 people) will be hired. One of the Directors should have impeccable experience in international scientific collaboration matters, whereas the other should know how administrative business is carried out in a Japanese national university, thus complementing each other. Six administrative sections will be created, to be in charge of General Affairs (including Personnel and Public Relations), Planning and	<Results/progress/alternations from initial plan> 1) Composition of administrative staff <Notable points of progress in FY 2009> 1. Appointment of the iCeMS Administrative Director: The newly appointed full-time Administrative Director, who has an academic background rich in international scientific collaboration (as former Dean of the Graduate School of Informatics, Kyoto University), will act as a pivotal liaison between the researchers and the administration.

Industry Liaison, Finance, Research Support and Intellectual Property, Facilities (Physical Plant), and Research Ethics and Safety. All sections will have at least two staff members who are fluent in English. For the qualifications of such administrative leaders, firstly, she/he needs to be familiar with university administrative matters, including those of Kyoto University, and to be able to plan and create new directions in the administration of this new Institute. On the other hand, she/he must have impeccable experience in international scientific collaboration matters. An especially close connection with the administrative headquarters of Kyoto University will be strongly required during the initial establishment of the center. Thus, the Director of Research Promotion of the Kyoto University Administration Bureau will be designated as the Administrative Director, and the Deputy Director will be recruited from a younger member of the career staff of JSPS (Japan Society for Promotion of Science) overseas center in Europe, for the above-mentioned necessity.	2. Establishment of the Overseas Researchers Support Office. 3. Hiring of a native speaker of English in the International Public Relations Office. 4. Periodic joint administrative staff meetings launched, including the iCeMS administration, CiRA Support Office, and CiRA Research Strategy Division. These are intended to enhance mutual cooperation between the iCeMS and the CiRA. <Composition> **Management Committee** • One Administrative Director • One Deputy Administrative Director • One Assistant Administrative Director **General Affairs** • One Manager • Six staff members, two of whom are dedicated to support for overseas researchers **International Public Relations** • One Manager • Three staff members (including one native speaker of English) **Finance** (including Intellectual Property Management): • One Manager • Eleven staff members **CiRA Support Office** • One Deputy Administrative Director (Head of the office) **General Affairs** • One Manager • Four staff members **Research Network Coordination** • One Manager **Finance**

	• One Manager • Six staff members **Contract Administration** • One Manager
2) Decision-making system The Director is responsible for all aspects of running the Institute, with the aid of the Deputy Director as well as the Administrative Director. A Steering Committee, which advises the Director, will consist of both scientists and non-scientists from within and outside Kyoto University, and will gather twice a year regularly, and accordingly upon the Director's request. The Core Committee Meeting of the Principal Investigators will provide scientific advice.	2) Decision-making system a) Executive Board: • established in FY 2007 as a management and decision-making process more independent and autonomous than the traditional faculty council system. • composed of the Director, Deputy Director, Chairman of the Board of PIs, and the Administrative Director. • holds regular meetings covering a variety of important issues (including human resources and budget allocation) in an effort to support the Director's leadership and decision making. b) Board of PIs: • established in FY 2007 to assist and advise the Director in his efforts to promote research activities. c) Research Planning Committee: • established in FY 2008 to advise the Executive Board concerning research planning and human resources-related decisions. • composed of PIs from various research fields as a framework to support the Director's decision-making. d) New efforts in FY 2009: Director **Nakatsuji,** accompanied by Administrative Director **Tomita**, visited the PIs' labs and held extensive interviews with each PI, discussing research progress, future plans and how to further develop cross-disciplinary collaboration involving the PI groups. The opinions and input collected in these candid exchanges are being incorporated into the daily operations and policy making of the Institute.
3) Allocation of authority between center director and host institution In the organizational structure of Kyoto University, this Institute will occupy a special position, freed from many binding rules of the classical Japanese	3) Allocation of authority between center director and host institution • Director's discretion: In FY 2007, Kyoto University revised its employment regulations and created the new "program specific professor" position, so that the iCeMS

university archetype, to present a future-model of a highly authorized research institute not only to Kyoto University but also throughout Japan and to the world. For this purpose, flexible rules of a new paradigm, as for the relationships with the university headquarters, the salary levels and deserved special bonuses, and the reduced duties in various committees and undergraduate education, will be created. These rules will be applied as a basis and model for the foundation of other research institutes within Kyoto University in the future. The Director will report directly to the President of Kyoto University and the Member of Executive Board in charge of research, but the Institute will basically be run autonomously.	Director can exercise his own discretion in determining researchers' salaries. In addition the "iCeMS Incentive" program was introduced. The Director has final approval authority for these financial incentives. • Researchers' burden reduction: In consideration of the iCeMS' mission statement, made as one of the WPI Research Centers, Kyoto University decided that iCeMS researchers shall be exempt from usual university administrative tasks, allowing them to fully concentrate on research activities.

5. Researchers and center staffs

i) “Core” to be established within host institution

Principal investigators

	At beginning	Planned for end of FY 2007	Final goal (Date: Apr 2009)	Results at end of FY 2008	Results at the end of FY 2009
Researchers from within host institution	12	12	13	11	11
Foreign researchers invited from abroad	0	4	5	3	4
Researchers invited from other Japanese institutions	2	3	3	3	3
Total principal investigators	14	19	21	17	18

All members

	At beginning	Planned for end of FY 2007	Final goal (Date: Apr 2009)	Results at end of FY 2008	Results at the end of FY 2009
Researchers <Number of foreign researchers among them and their percentage> [Number of female researchers among them and their percentage]	70 < 10, 15%>	111 < 29, 27%>	171 < 52, 31%>	90 < 16, 18%> [15, 17%]	151 < 46, 31%> [43, 29%]
Principal investigators <Number of foreign researchers among them and their percentage> [Number of female researchers among them and their percentage]	14 < 0, 0%>	19 < 4, 22%>	21 < 5, 24%>	17 < 2, 12%> [2, 12%]	18 < 3, 17%> [2, 12%]
Other researchers <Number of foreign researchers among them and their percentage> [Number of female researchers among them and their percentage]	56 < 10, 18%>	92 < 25, 28%>	150 < 48, 32%>	73 < 14, 20%> [13, 18%]	133 < 43, 33%> [41, 31%]
Research support staff	45	53	59	43	64
Administrative staff	27	29	29	19	28
Total	142	193	259	152	243

Note: Prof Yamanaka and his group members are included in the iCeMS table, and not in the CiRA table below.

All members (CiRA)

	At beginning	Planned for end of FY 2007	Final goal (Date: month, year)	Results at end of FY 2008	Results at the end of FY 2009
Researchers <Number of foreign researchers among them and their percentage> [Number of female researchers among them and their percentage]	-	-	-	31 < 2, 7%> [10, 33%]	52 < 1, 2%> [16, 31%]
Principal investigators <Number of foreign researchers among them and their percentage> [Number of female researchers among them and their percentage]	-	-	-		-
Other researchers <Number of foreign researchers among them and their percentage> [Number of female researchers among them and their percentage]	-	-	-	31 < 2, 7%> [10, 33%]	52 < 1, 2%> [16, 31%]
Research support staff	-	-	-	25	24
Administrative staff	-	-	-	12	18
Total	-	-	-	68	94

ii) Satellites <Initial plan> <u>Institution (1)</u> <u>Faculty of Applied Biological Sciences, Gifu University</u> -Role Collaboration and instruction between glycol-technology and stem cell biology -Personnel composition and structure A PI -Collaborative framework In relation to the chemical reaction between: - cells and cells - cells and air quality	<FY 2009 Results/progress/alternations from initial plan> <u>Institution (1)</u> <u>Faculty of Applied Biological Sciences, Gifu University</u> -Role No change -Personnel composition and structure Prof **Makoto Kiso**, Assoc Prof **Hiromune Ando** -Collaborative framework No change -Progress in FY 2009 260 square meters of new laboratory space were added, augmenting Gifu University's role as a satellite facility. Collaborative research with the **Kusumi** and **Hashida** Labs continued. Also, cross-disciplinary research of the glycobiology of stem cells is starting together with the stem cell groups of the iCeMS.
iii) Partner institutions <Initial plan> <u>Institution (1)</u> <u>Bionanotechnology Interdisciplinary Research Centre, the University of Oxford</u> -Role Collaborative research on DNA-based nano-meso technology -Personnel composition and structure Prof John Ryan -Collaborative framework Academic exchanges of ideas, samples, PIs, postdocs, and graduate students	<FY 2009 Results/progress/alternations from initial plan> <u>Institution (1)</u> <u>Bionanotechnology Interdisciplinary Research Centre, the University of Oxford</u> -Role Collaborative research on the structure-function of G-protein-coupled receptors. -Personnel composition and structure Profs **John Ryan, Anthony Watts, Dustin Molloy,** and **Simon Davis** -Collaborative framework Academic exchanges of ideas, samples, PIs, postdocs, and graduate students. -Progress in FY 2009

	Because the Bionanotechnology Interdisciplinary Research Centre at the University of Oxford is a time-limited organization, and its financial support period ended in 2009, this partnership was terminated. However, collaborative research projects will continue at the level of individual researchers.
Institution (2) Wellcome Trust Centre for Stem Cell Research, The University of Cambridge	Institution (2) Wellcome Trust Centre for Stem Cell Research and its sister institute, Wellcome/Gurdon Institute, Cambridge University
-Role Research collaboration in interdisciplinary stem cell biology studies	-Role No change
-Personnel composition and structure	-Personnel composition and structure Profs **Fiona Watt, Austin Smith, Azim Surani**
-Collaborative framework Joint research and academic interaction including the professors, postdocs and graduate students visiting one another	-Collaborative framework No change -Progress in FY 2009 Prof **Fiona Watt** continued in her capacity as a member of the iCeMS Advisory Committee, furthering mutual cooperation. Prof **Austin Smith** coauthored a research paper with Prof **Shinya Yamanaka** on pluripotent stem cells. Prof **Azim Surani**, a world leader in the research field of pluripotent stem cells and reprogramming in the germ cell lineage, became a visiting professor of the iCeMS; collaboration with Prof **Surani** will contribute to the iCeMS' progress toward assembling the world's strongest team of researchers in the biological functions and mechanisms of reprogramming and pluripotency.
Institution(3) National Centre for Biological Sciences (NCBS), Bangalore, India	Institution (3) National Centre for Biological Sciences (NCBS), Bangalore, India
-Role Collaborative research on membrane meso-domains	-Role Collaborative research on membrane meso-domains
-Personnel composition and structure	-Personnel composition and structure

Profs Satyajit Mayor and K. VijayRaghavan -Collaborative framework Academic exchanges of ideas, samples, PIs, postdocs, and graduate students. Co-sponsoring meetings and symposia.	Profs **Satyajit Mayor** (Academic Dean), **Madan Rao**, and **K VijayRaghavan** (director of the NCBS) -Collaborative framework Academic exchanges of ideas, samples, PIs, postdocs, and graduate students. Co-sponsoring meetings and symposia. -Progress in FY 2009 (1) Dr **Rahul Chadda**, who obtained his PhD under the guidance of Prof **Satyajit Mayor**, a key person in this partner institution, joined the iCeMS in May 2008 as a postdoctoral fellow. He is now engaged in a project of forming micron-scale membrane domains, based on the nano-meso domains in the plasma membrane, in order to investigate the physical properties of nano-meso domains in the plasma membrane. Understanding membrane meso-domains is the key target of the collaborative research between the NCBS and the iCeMS, and therefore, Dr **Chadda** is a key person for this collaborative research project. This year (from November 30), he successfully obtained his independent support as a JSPS postdoctoral fellow from abroad, but continues to be affiliated with the iCeMS. (2) The NCBS will co-sponsor the Sixth International Symposium of the iCeMS, on “Nano-Meso Membrane Mechanisms”, to be held January 27–29, 2010. Profs **Satyajit Mayor** and **Madan Rao** of the NCBS gave invited talks at this symposium. (3) Collaborative research on the plasma membrane meso-domains by the cortical actin skeleton by Profs **Satyajit Mayor** and **Madan Rao** of the NCBS, and Profs **Takahiro Fujiwara**, **Kenichi Suzuki**, and **Aki Kusumi** and Dr **Ziya Kalay**, is in progress, and a manuscript will soon be submitted. (4) A visit by Prof **Aki Kusumi** to the NCBS was made on December 2 and 3, 2009, for the purpose of discussing further collaboration, expanding the collaborative front toward stem-cell research, and setting up mutual satellite labs in each institute. At the NCBS, the Center for Meso-Bio Single-Molecule Imaging (CeMI) of the iCeMS was asked to have a satellite, so that more extensive collaboration becomes possible with many scientists at the NCBS. The NCBS director **K VijayRaghavan** is extremely enthusiastic about supporting the iCeMS satellite there, in terms of funding

	people, instruments, and space. A Memorandum of Understanding (MoU) will be exchanged in the near future. In addition an exchange seminar, involving approximately 5–10 PIs from each institute, is being planned. (5) In terms of expanding the collaboration front toward stem cell research, two consecutive discussions were held on December 2 and 3, with Profs **S Ramaswamy** and **Jyotsna Dhawan**, Deans of the Institute for Stem Cell Biology and Regenerative Medicine (inStem) of the NCBS. A plan was developed to hold a joint seminar during FY 2010 and to start exchanges of students and faculty members. (6) Between March 3 and 6, 2010, Prof K VijayRaghavan (The NCBS director) and Prof Aki Kusumi of the iCeMS met and held discussions on the occasion of the HFSPO (Human Frontier Science Program Organization) symposium held in Strasbourg. They discussed applications of single-imaging technologies to the problems of developmental biology and stem-cell research, agreed on making this direction as one of the main focuses of the collaboration between the NCBS and the iCeMS.
Institution(4) Max Planck Institute for Molecular Cell Biology and Genetics -Role Collaborative research on vesicular-transport meso-complexes -Personnel composition and structure Prof Kai Simons -Collaborative framework Academic exchanges of ideas, samples, PIs, postdocs, and graduate students	Institution (4) Max Planck Institute for Molecular Cell Biology and Genetics (MPI-CBG) -Role Collaborative research on vesicular-transport meso-complexes -Personnel composition and structure Profs **Kai Simons**, **Wieland Huttner**, **Mario Zerial**, and **Jonathan Jones** are the key scientists of collaboration at the MPI-CBG, to be joined by many more in the future -Collaborative framework Academic exchanges of ideas, samples, PIs, postdocs, and graduate students -Progress in FY 2009 (1) Between August 30 and September 1, 2009, Prof **Kai Simons** of the MPI-CBG and Prof **Aki Kusumi** of the iCeMS met and held discussioins on the occasion of the EMBO (European Molecular Biology Organization) conference held in Amsterdam. Prof **Simons**, together with Prof **Gerrit van Mere** of the Utrecht University organized a session on “Membrane

	Raft Domains", and invited Prof **Kusumi** for their symposium. They discussed collaborative directions covering many overlapping areas of the iCeMS and the MPI-CBG: vesicular-transport meso-complexes, protein cluster functions in cells during tissue development, and nanobiotechnology. (2) Prof **Jonathan Jones** of the MPI-CBG visited the iCeMS between December 9 and 11, 2009, gave a seminar, and discussed his future collaborative research with Prof **Yoshie Harada** of the iCeMS and the general collaborative scheme between the iCeMS and the MPI-CBG with Assoc Prof **Shintaro Sengoku**. (3) Between March 3 and 6, 2010, Prof **Kai Simons** of the MPI-CBG and Prof **Aki Kusumi** of the iCeMS met and held discussions on the occasion of the HFSPO (Human Frontier Science Program Organization) symposium held in Strasbourg. Exchanges of different expertises, i.e., mass spectroscopy of lipids (MPI-CBG) and single-molecule imaging of lipids (iCeMS) were discussed.
<u>Institution(5)</u> <u>California NanoSystems Institute, UCLA</u> -Role While PCPs (PCP: porous coordination polymer) are mainly constructed by coordination bonds, zeolites are dominated by ionic bonds and activated carbon by covalent bonds. The advantage of the latter chemical bond types is stability against thermal and mechanical stimuli, which is important for industrial applications. Therefore, Kitagawa PI's and Yaghi's groups develop synthetic methods of new materials, which are characterized by covalent organic frameworks with porous crystalline forms constructed solely from light elements (H, B, C, N, and O), and discover new type of functions including sensing, trapping, and conversion of molecules as catalysts, which perform even in biological environment. -Personnel composition and structure Yaghi and coworkers will continue to create these materials while Kitagawa and coworkers plan to explore the functions of such novel porous compounds. Both leaders will allocate at least one postdoctoral fellow to this	<u>Institution (5)</u> <u>California NanoSystems Institute, UCLA (CNSI)</u> -Role Development of new porous materials directed to meso-scaled cell-materials chemistry 1. New materials involving functions of carbons, zeolites, and porous coordination polymers will be synthesized by controlling unique bond characters in the internal spaces. The materials will be applicable for storage of small molecules and heterogeneous catalysts in biological systems. 2. New porous biomaterials will be developed by using caged proteins for applications to biocompatible materials and cellular reactions based on the information obtained by researches of existing porous materials. -Personnel composition and structure Prof **Omar Yaghi** (porous materials) and Prof **James Gimzewski** (biomaterials STM and AFM). Also, Profs **Yaghi** and **Susumu Kitagawa** will exchange postdoctoral fellows for their collaboration.

project. -Collaborative framework New PCPs will be prepared in Yaghi's group, CNSI while the function is designed and the materials are prepared by Kitagawa's group. Kitagawa PI hires at least one post doctoral fellow for the purpose. They keep the further close and enduring relationship by an internet communication and organize a on-site meetig in either Kyoto or Los Angels in every year.	-Collaborative framework A Memorandum of Understanding (MoU) was exchanged in March 2010. Both research centers will interactively proceed with synthesis of novel porous materials and the modification of caged proteins by Prof **Kitagawa** and Assoc Prof **Takafumi Ueno**. The evaluations of their structure and biological function will be conducted at the iCeMS and the CNSI. Each group will allocate at least one postdoctoral fellow to this project. In addition to regular interactive communication, annual on-site meetings are planned for research exchanges in either Japan or the U.S. -Progress in FY 2009 On April 10, 2009, Prof **Aki Kusumi** of iCeMS visited the acting director of CNSI, Prof **Lenard Rome**, and the CNSI research director, Prof **Fuyuhiko Tamanoi**, and discussed the basic framework and the platform agreement for collaboration between the two institutions. On June 4 and 5, 2009, Assoc Prof **Ueno** presented his research in the seminar at the CNSI and discussed individually with Profs Lenny Rome, **James Gimzewski**, and **Fuyu Tamanoi** regarding plans for the collaborative research with them. On June 23, 2009, Dr **David Lundberg** (CNSI Director for International Partnership) visited the iCeMS and discussed with Director **Nakatsuji** and Administrative Director **Tomita** regarding contents of alliance and the schedule for the future. From July 2009, Assoc Prof **Ueno** started joint research with Prof **James Gimzewski** and his members. Based on results from preliminary experiments, Research Associate **Satoshi Abe** in Assoc Prof **Ueno** Team will visit **Gimzewski** Lab to observe protein assemblies by AFM from June 1 to August 31 in 2010. On August 26, 2009, Prof **Fuyu Tamanoi** visited the iCeMS and gave a presentation in a seminar. Prof **Tamanoi** discussed with Director **Nakatsuji** and Administrative Director **Tomita** regarding exchange

	programs and had scientific discussions with Prof **Hashida** and Asst Prof **Murakami** regarding drug delivery. The members also discussed joint programs between the research centers. On October 17, Prof **Aki Kusumi** of the iCeMS visited Prof **Fuyuhiko Tamanoi** of the CNSI, and discussed the collaborative research on small G-proteins and cancer treatments. Between October 20 and 22, 2009, Prof **Kitagawa** met Prof **Yaghi** at the SERMACS 2009 (Puerto Rico) and discussed further about the content of the research into COF materials. Prof **Yaghi** then visited the laboratory of Prof **Kitagawa** on November 10th and discussed with Assoc Prof **Matsuda** about the collaboration project. An MoU was exchanged in March 2010.
Institution(6) Membrane Center, Purdue University - Role Collaborative research of on-chip membrane technology -Personnel composition and structure Prof Ken Ritchie -Collaborative framework Academic exchanges of ideas, samples, PIs, postdocs, and graduate students	Institution (6) Center for Basic and Applied Membrane Sciences, Purdue University -Role Collaborative research of on-chip membrane technology -Personnel composition and structure Prof **Ken Ritchie** -Collaborative framework Academic exchanges of ideas, samples, PIs, postdocs, and graduate students -Progress made in FY 2009 Prof **Ken Ritchie**, a physicist, is interested in collaborating with the iCeMS on the development of nano-meso technologies that could be applied to studying and regulating embryonic as well as induced pluripotent stem cells, by working on their plasma membranes. Prof **Ritchie** participated in the Sixth iCeMS International Symposium to be held January 27–29, 2010.
Institution(7) The Center for Developmental Biology, RIKEN - Role	Institution (7) The Center for Developmental Biology, RIKEN -Role

Research collaboration between developmental biology and stem cell biology -Personnel composition and structure -Collaborative framework Joint research and academic interaction among the professors, postdocs and graduate students	No change -Personnel composition and structure Center Director **Masatoshi Takeichi**, Team Leader **Masayo Takahashi**, and other CDB members involved in the national network of iPS cell research. -Collaborative framework No change -Progress in FY 2009 Dr **Masatoshi Takeichi** was a guest lecturer at the 4th iCeMS International Symposium, in addition to continuing in his role as a member of the iCeMS Advisory Committee. A paper coauthored by Dr **Masayo Takahashi** and Prof **Shinya Yamanaka** was published in Neuroscience Letters. Throughout the year the CiRA and the CDB continued their collaboration in the MEXT Project for Realization of Regenerative Medicine, a national network centered on the CiRA's research efforts on iPS cells.

6. Summary of center's research environment

<Initial plan> 1) Environment in which researchers can devote themselves to their research The Board Committee, consisting of the director, deputy director and administrative director, is to be formed and to be engaged in the general management of the institute. Six administrative sections will be created, to be in charge of General Affairs (including Personnel and Public Relations), Planning and Industry Liaison, Finance, Research Support and Intellectual Property, Facilities (Physical Plant), and Research Ethics and Safety. All sections will have at least two staff members who are fluent in English. Researchers are exempt from administrative tasks. The PI Board is engaged in only research-related tasks. Two secretaries are to be assigned to each PI group.	<Results/progress/alternations from initial plan> <u>1) Environment in which researchers can devote themselves to their research</u> The newly appointed full-time Administrative Director, who has an academic background rich in international scientific collaboration (as former Dean of the Graduate School of Informatics, Kyoto University), will act as a pivotal liaison between the researchers and the administration. The iCeMS has 26 administrative staff members and 59 research support staff members, which is an increase of 23 members from the previous year. The CiRA has 15 administrative staff members and 29 research support staff members, which is an increase of 7 members from the previous year. The Research Strategy Division of the CiRA is comprised of four functions: research management, contract management, intellectual property, and international public relations. Its overall aim is to lay out mid- and

	long-term research strategies for the center. Periodic joint staff meetings, including the iCeMS administration, CiRA Support Office, and CiRA Research Strategy Division, enhance mutual cooperation. In consideration of the iCeMS' mission statement, made as one of the WPI Research Centers, Kyoto University decided that iCeMS researchers shall be exempt from usual university administrative tasks, allowing them to fully concentrate on research activities. The Overseas Researchers Support Office was established to assist foreign researchers in quickly and smoothly adapting not only to the new research environment but also to their new lives in Japan.
2) Start-up research funding In addition to general support, PIs joining outside of Kyoto University will be provided with annual financial support as a start-up fund ranging from US$300,000 to US$1,000,000 for two years for the purchase of research equipment and other office supplies. Laboratory space will be renovated and equipped with basic research facilities.	<u>2) Startup research funding</u> In FY 2009, four research groups headed by iCeMS PIs recruited from outside the university received startup funding of about JPY10,000,000/US$100,000 (US$1 = JPY100) each, in addition to necessary research equipment for each group. An annual budget (including the researcher's salary) of up to JPY30,000,000/US$300,000 (US$1 = JPY100) was allocated to each foreign iCeMS Kyoto Fellow, a newly created independent junior faculty position. Most notably, a startup fund equivalent to JPY100 million/US$1 million (US$1 = JPY100) mainly covering equipment costs for a next generation optics system was provided for Asst Prof **Peter Carlton**, an iCeMS Kyoto Fellow, who was hired to further develop optical microscopy technology used to examine meso-scale cellular architectures. The Kyoto Fellows from abroad have also been given priority over lab space at iCeMS Complex 1 and 2.
3) Postdoctoral positions through open international solicitations Researcher posts at the iCeMS are classified into principal investigators, associate professors, assistant professors and post-doctoral fellows. These posts are to be advertised internationally through every possible means such as advertisement on prominent magazines such as "Nature" and "Science."	<u>3) Postdoctoral positions through open international solicitations</u> Job advertisements were placed on the iCeMS website and in international scientific magazines including *Nature* and *Science*.

4) Administrative personnel who can facilitate the use of English in the work process English is to be used as the official language to form English-language administration.	4) Administrative personnel who can facilitate the use of English in the work process and environment In FY 2009, a native speaker of English was hired in the International Public Relations Office, and English-speaking administrative staff now account for 50 percent of the total. In addition, 18 bilingual secretaries have been hired and assigned to each PI lab, further improving administrative support and services for foreign researchers.
5) Rigorous system for evaluating research and system of merit-based compensation Interim evaluations are to be conducted by the external committee chosen from home and abroad in 3, 5, 8 and 10 years, and a merit-based pay system is to be employed.	5) Rigorous system for evaluating research and system of merit-based compensation The "iCeMS Incentive" program has been introduced and implemented. The Director has final approval authority for financial incentives (up to JPY300,000/US$3,000 (US$1 = JPY100) per month). The first Advisory Committee Meeting was held on May 29, 2009, the final day of the 4th iCeMS International Symposium, during which several iCeMS PIs presented their research progress and highlighted new developments at the institute. The Advisory Committee members provided their professional and expert advice. They contributed valuable suggestions toward overall strategy, forming an effective response to the needs of the institute.
6) Equipment and facilities, including laboratory space, appropriate to a top world-level research center Laboratories, lounges and equipment suitable for a World Premiere International Research Center are to be prepared In iCeMS research buildings, walls among different research groups are to be removed and many laboratories are to be shared by several research groups, which is expected to encourage the interaction of the different research groups on a daily basis.	6) Equipment and facilities, including laboratory space, appropriate to a top world-level research center a) Facilities In September 2008, the first research building (iCeMS Complex 2) was completed, with approximately **2,500 m^2** of floor space. In March 2009, the iCeMS headquarters building (iCeMS Complex 1) was completed with approximately **5,000 m^2** of floor space. In September 2009, another approximately **500 m^2** of floor space in a building adjacent to the first research building (iCeMS Complex 2) was added to increase total laboratory space. The researchers' offices in Complex 1 and 2, in which no walls separate PI groups, are designed to facilitate daily communication among researchers from various fields in order to promote cross-disciplinary research.

	In November 2010, a new building (approximately **3,000 m^2**) at Complex 2 is scheduled to be completed. Another new building of approximately **12,000 m^2** was completed in February 2010 as research space for the CiRA. In June 2009 the Gifu University satellite of the iCeMS opened a new research laboratory of **260 m^2**. This satellite is centered on the research team led by Prof **Makoto Kiso**, focusing on the chemical synthesis of sugar chains and other glycans, in particular those that exist on cell surfaces. The varied functions performed by these compounds are expected to play a key role in the development of meso-control of stem cells and regenerative medicine applications involving ES and iPS cells. This new facility ranks the Gifu satellite among leading laboratories in Japan with its advanced hooded lab benches and other safety features necessary in an organic chemical synthesis laboratory. b) Equipment In FY 2009, government financial support such as the supplementary budget made it possible to purchase large-scale analysis equipment for stem cell sorting and gene expression profiling, artificial materials and new compounds. Researchers from various fields share equipment rooms and laboratories, promoting daily communication. This open environment stimulates cross-disciplinary research activities throughout the institute.
7) International research conferences or symposiums held regularly to bring world's leading researchers together In order to encourage the useful interaction between world top-notch researchers and researchers of the iCeMS, international research symposia are to be held periodically at least twice a year. Themes of these symposia are to be comprehensive as well as concrete.	<u>7) International research conferences or symposia held regularly to bring together the world's leading researchers</u> a) International Symposia The 4th iCeMS International Symposium Date: May 27–29, 2009 Title: Integrated Physical/Chemical Biology of the Cell: from Genes to Membrane Systems Attendance: 193 researchers including nine guest lecturers from abroad The 5th iCeMS International Symposium

	Date: July 27–28, 2009 Title: Biomaterials at the interface of chemistry, physics, and biology Attendance: 157 researchers including nine guest lecturers from abroad The 6th iCeMS International Symposium / The 13th Membrane Research Forum Date: Jan 27–29, 2010 Title: Nano-Meso Membrane Mechanisms Attendance: 210 researchers including 11 guest lecturers from abroad b) iCeMS Seminars In FY 2009 a total of 31 iCeMS Seminars were held, for which renowned scientists were invited from all over the world.
8) Other measures, if any	<u>8) Other measures, if any</u> a) Establishment of the Innovation Management Group (IMG) In FY 2009, the iCeMS established the Innovation Management Group, headed by a newly recruited full-time Associate Professor, with the purpose of accelerating the fusion of multiple fields of science, enhancing the management of interdisciplinary and international collaboration, and boosting university-industry interaction as well as the intellectual property management study. b) Seminars and reading club to enhance the integrity of researchers To enhance the scientific integrity of its researchers, the iCeMS organized various seminars and a biweekly lunch time reading club. These are also intended to encourage interaction among young researchers belonging to different research groups. Reading material during FY2009 was taken from: *On Being a Scientist – A Guide to Responsible Conduct in Research* (National Academy of Sciences and others, USA) c) The 1st iCeMS Retreat Lively scientific exchanges among researchers, potentially leading to increased cross-disciplinary collaboration, marked the first overnight retreat that took place in the early autumn of 2009 in the northern suburbs of Kyoto. The 77 participants enjoyed fruitful discussions with colleagues from other fields during the lectures, poster presentations, and

brainstorming sessions.

d) iCeMS Cross-disciplinary Seminars

In FY 2009, a total of 15 iCeMS Cross-disciplinary Seminars have been held. At these seminars, an iCeMS researcher gives a presentation highlighting his or her research plan and progress, followed by active discussions among participants to promote cross-disciplinary research.

e) Outreach Activities of the iCeMS

A public symposium was held in October 2009 introducing various aspects of iPS cell research ranging from basic knowledge to leading edge research.

"iCeMS-CiRA Classroom" for high school students:
The iCeMS and the CiRA co-hosted a hands-on research program for high school students focusing on stem cell studies in November 2009.

32 students selected out of 200 applicants visited Kyoto University to attend the two-day program, in which they were instructed to "think and act like scientists." They were given a rare opportunity to speculate and make hypotheses, followed by experiments for obtaining data to prove or disprove their theories.

In September 2009, Kyoto University and the iCeMS held an open symposium at Gifu University, location of the iCeMS satellite lab, as part of an effort to make the iCeMS' cross-disciplinary research better known to the public.

In FY 2009, the 6th and 7th iCeMS Cafés were held at the main building of the iCeMS. The two events, entitled "Explore with invisible light" and "Turning DNA into Origami," attracting 30 and 24 participants from the public, respectively.

Much like a science café, the "iCeMS Cafés" are a series of events open to the public, featuring face-to-face conversations between iCeMS researchers and area residents over tea and coffee in a relaxed, friendly atmosphere.

7. Criteria and methods used to evaluate center's global standing

<Initial plan>
The iCeMS will form the international evaluation committee to assess whether:
1. researchers are individually achieve world-class research

<Current assessment>
1. Individual researcher accomplishments

- The **Kitagawa** Lab successfully utilized the nanochannels of a porous material to synthesize a polymer with high proton conductivity. This makes possible the conduction of other ions (such as sodium), which could lead to a breakthrough in the creation of artificial transport mechanisms across cell boundaries. The results were published in *Nature Materials*.

- The journal *Nature Chemistry* highlighted recent research progress by publishing a review article authored by Prof **Kitagawa**, which described in depth the important properties of novel porous materials. These can be useful to materials and bio-sciences, illustrating the developing new field of soft porous crystals.

- Thompson Reuters' ScienceWatch singled out a paper coauthored by Prof **Kitagawa** in 2003 for the high frequency with which it has been cited by researchers worldwide. The paper, which has had significant impact on the field of materials science, described the properties of a coordination polymer in the nanometer regime.

- Prof **Yamanaka** was the recipient of the Albert Lasker Basic Medical Research Award, the most prestigious honor of its kind in the United States. In addition, an applied iPS cell research project proposed by Prof **Yamanaka** was chosen by the Japanese government's Cabinet Office as one of a select number of leading national scientific programs.

- The journal *Developmental Cell* published a paper from the **Nakatsuji** Lab describing the novel role of a gene, TDRD9, in molecular defense systems of the genome and chromatin in the mammalian germ cell lineage. This finding was selected as a high-impact paper and featured in the "Previews" section of the journal.

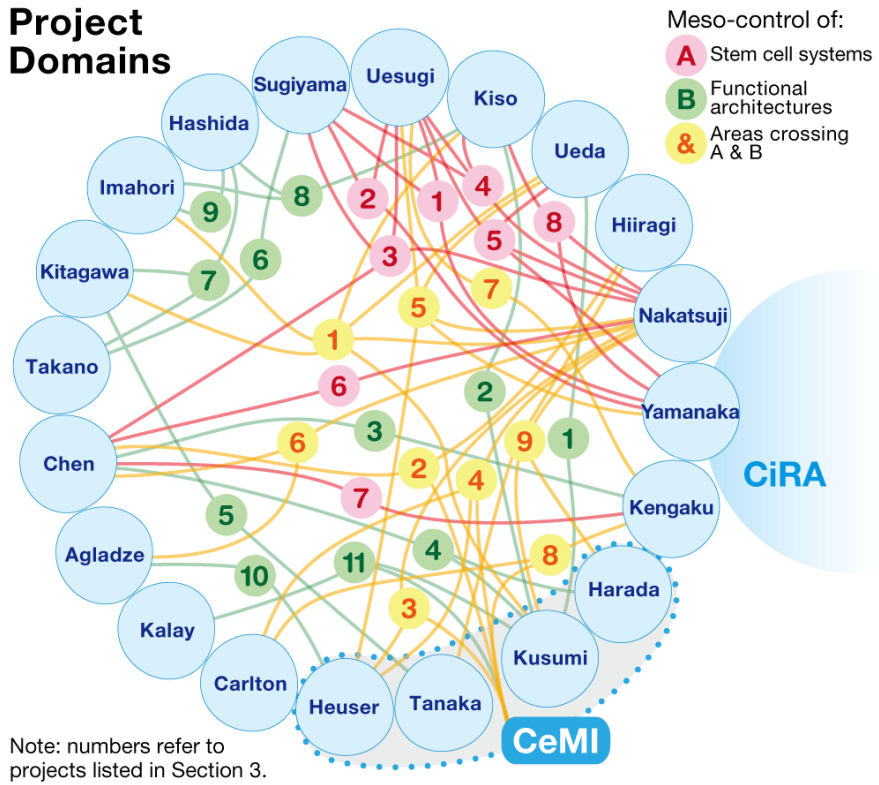
- The journal *Nature Chemistry* published a paper by Prof **Takano** describing his success in affecting the spin transition in a four-coordinate iron oxide, and also featured the paper on the cover of the journal.

- The journal *Chemistry & Biology* published a paper by Prof **Uesugi**, in which he described the properties of a unique molecule that promotes cell

	adhesion and growth. Prof **Uesugi**'s discovery of this molecule was featured on the cover of the journal. • The journal *Chemistry & Biology* published a paper by Prof **Uesugi,** in which he described a small molecule that blocks fat synthesis by inhibiting the activation of sterol regulatory element binding proteins. This finding received international media coverage, including by *Reuters, the Daily Express* (UK), *the Asahi Shimbun* (a leading national newspaper in Japan; featured on the first page twice) and others. • Prof **Kazumitsu Ueda** received the JSBBA's (Japan Society for Bioscience, Biotechnology, and Agrochemistry) top prize in March 2010 on recognition of his diligence in the field of ABC proteins, building on the first isolation of MDR1 from eukaryotes over 20 years ago. • A total of 169 invited lectures by the iCeMS PIs have been given for FY 2009 (58 at international symposia held overseas, 33 at international symposia held in Japan).
2. joint-research between the PIs are making progress	<u>2. Accomplishments by researchers working jointly</u> • A total of 28 joint projects are ongoing as shown below. In order to encourage such developments, priority was given in hiring researchers intending to engage in collaborative research, and new cross-disciplinary projects were financially promoted with the Exploratory Grants for junior investigators. See Section 3 for a list of the 28 collaboration projects.

3. the administration and support system for researchers are sufficiently functioning as an international center

4. the center is in the global career flow



3. Level of internationally-competitive administration and support

- A native speaker of English joined the administration in FY 2009, aiding the Institute's English communication efforts.
- In addition to the standard use of English in all PI meetings and at official Institute events, administrative announcements to researchers are mainly written in English.
- The Overseas Researchers Support Office was established in FY 2009 in order to assist the increasing number of foreign researchers with visas, housing, and other issues related to life in Japan.

4. Degree to which the center is a part of global personnel movement

- The implementation of a roadmap for faculty recruitment has raised the

	number of foreign researchers to 46 (over 30% of the total) as of March 31, 2010. • An international effort to recruit young, promising researchers for the new iCeMS Kyoto Fellow positions attracted over 30 applicants, two of whom were selected from overseas for a total of four new Fellows. These scientists will establish independent research labs on par with the PIs, receiving sufficient work space and startup funds to pursue collaborative, cross-disciplinary research projects. • In order to accelerate internationalization and cross-disciplinary research at the Institute, 17 researcher positions were created exclusively for foreign researchers under the iCeMS Director's initiative, as part of a continuing effort. • During FY 2009 an iCeMS postdoc was selected for an assistant professorship at the Indian Institute of Technology. Three other postdocs similarly received appointments up to the assistant professor level. • 107 researchers from overseas visited the iCeMS in FY 2009.
5. collaboration with researchers from the East and Asia are promoted.	<u>5. Degree to which exchange is taking place with researchers throughout Asia</u> • Extensive academic and personnel exchange is taking place between the iCeMS and the National Centre for Biological Sciences (NCBS) in Bangalore, India. In addition to the key role played by a NCBS graduate who is now a postdoctoral fellow of the iCeMS, the NCBS cosponsored the iCeMS' Sixth International Symposium held January 27–29, 2010. • Prof **Nakatsuji** is a member of the Scientific Advisory Board of the Australian Stem Cell Centre. In addition, he plays active advisory roles for stem cell research groups at the National Health Research Institutes in Taiwan. • Four graduate students from the Indian Institute of Technology and the University of Delhi, while taking part in internships in Japan, visited and toured the iCeMS. They expressed interests in returning to Japan for possible postdoctoral training.

8. Securing competitive research funding

<Initial plan>
The PIs are to obtain a large amount of competitive research grants from governmental bodies, such as JSPS, JST, and so forth.

<Results/progress/alternations from initial plan>
In FY 2009, a workshop on applying for competitive grants was held for young researchers, in order to encourage, advise, and increase applications for external grants. The Institute's administration also offers support to foreign researchers in completing applications, especially those requiring documentation in Japanese.

Researchers of the Institute have acquired a total of JPY3.1 billion/US$31 million (US$1 = JPY100) external research grants as of December 2009; JPY1.0 billion/US$10 million in Grants-in-Aid for Scientific Research, and JPY2.1 billion/US$21 million from other competitive research grants.

*US$1 = JPY100 (Unit: US$ million)

Grants-in-Aid for Scientific Research	10
Other competitive research grants	21
Total	31

In addition, the iCeMS received JPY2.6 billion/US$26 million (US$1 = JPY100) in government supplementary funding.

9. Other important measures taken to create a world premier international research center

<Initial plan>
- Mentor development program
- Scientific integrity and communication program
- Program to support foreign/young researchers
- Program to recruit and nurture female researchers

<Results/progress/alternations from initial plan>
1) Scientific integrity, communication and mentoring program

The iCeMS hosts seminars and started a biweekly lunch time reading club aiming to nurture the Institute's researchers to develop the highest sense of scientific integrity and social responsibility.

In the reading club, iCeMS researchers get together and discuss reading materials relevant to scientific integrity, mentoring, conduct of research, authorship, intellectual property and so forth.

Objectives are to provide opportunities to:
- broaden researchers' perspective on science, as scientists.
- get to know iCeMS researchers from other labs.
- learn and discuss together in English using quality reading materials.

Reading material during FY 2009 was taken from: "*On Being a Scientist – A Guide to Responsible Conduct in Research*" (National Academy of Sciences

	and others, USA). 2) Support for female researchers An increasing number of female researchers are joining the iCeMS, currently accounting for 28% of the total as of March 31, 2010. Counseling and support services for female researchers will be offered at a new office to be established within the iCeMS. 3) Symposium open to the public A public symposium was held in October 2009 introducing various aspects of iPS cell research ranging from basic knowledge to leading edge research. 4) iCeMS-CiRA Classroom for high school students The iCeMS and the CiRA co-hosted a hands-on ES and iPS cell research program for high school students in November 2009. 32 students selected from 200 applicants visited Kyoto University to attend the two-day program, in which they listened to iCeMS researchers' lectures and observed living cells with research-grade microscopes. This program aims not only to teach students about scientific facts such as the self-renewal potential or pluripotency of ES and iPS cells, but to give them the opportunity to realize that science is based on cumulative knowledge acquired over generations of experimentation and hypothesis testing.

10. Host institution's commitment

<Initial plan>	<Results/progress/alternations from initial plan>
1. Provision in host institution's mid-to-long-term plan Kyoto University distinctively places the "World Premier International Research Center Initiative" as its top priority program in the current (2004 to 2009) and the next (2010 to 2015) mid-term plans. As clearly defined in its mission statement, the university has strived for sustainable human societies, which are featured by harmonious coexistence within human and ecological communities on this planet, by bringing forth its outstanding research and education programs generating world-class knowledge. Kyoto University believes that establishing a world top-level academic research center within the university is an indispensable step to further promote this mission and to achieve the ultimate goal for the sustainable human societies. Under the strong leadership of the president, Kyoto University is vigorously committed to promote this program, and to actively take concrete and responsible measures, such as preparation of research systems and provision of resources, for establishing the world premier international research center to lead the world's research activities.	1. Provision in host institution's mid-to-long-term plan Kyoto University's current mid-term strategies related to the iCeMS include the following documents: Actions to Enhance the Quality of the University's Education and Research Environment; Actions to Achieve Research Targets; Special Actions to Support Research; and the Research Environment Initiative. These documents have been amended to include the following: "Special measures will be undertaken to form an organization promoting creation of a new generation of technologies by developing meso-control science and stem cell research at the iCeMS, a WPI research center." Kyoto University President **Hiroshi Matsumoto**, sworn in on October 1, 2008, made the following commitment: "From October 1, 2008, I will be responsible for performing tasks and duties described in Application Form 4, Host Institution's Commitment, signed by Prof **Kazuo Oike** (former president) on September 25, 2007." It should be noted that President **Matsumoto** also affirms the host institution's commitments to the "Center for iPS Cell Research and Application" (CiRA) established in recognition of the successful creation of human induced pluripotent stem (iPS) cells by Prof **Shinya Yamanaka**, one of the iCeMS PIs. The preceding paragraphs continue to apply to the iCeMS in FY 2009. In addition, as of April 1, 2010 the CiRA is slated to become an individual research institute in the university. Thanks to the effective leadership of university President **Matsumoto**, various opinions related to this change were consolidated on all levels while simultaneously making a necessary high priority budget request to the Ministry of Education, Culture, Sports, Science and Technology (MEXT).
2. Concrete Measures (1) Competitive grants obtained by researchers participating in the project and in-kind contributions, etc.	2. Concrete Measures <u>(1) Competitive grants obtained by researchers participating in the project and in-kind contributions, etc.</u>

To facilitate the center's researchers obtaining external funds, the university provides the various supports including startup funds. The funds will be used to support young researchers and foreign researchers to pursue research until they obtain their own external funds. The university will also provide researchers with various supports in every aspect of preparing the applications. The university provides five positions and expenses for principal investigator-class personnel in order to enable Kyoto University's world-leading researchers to conduct academic research at the center while cooperating with their original departments, as well as to minimize the impact of the absences of top-level researchers on their departments' educational and research activities. For administration, the university provides full-time administrative staff and necessary personnel expenses in order to establish an independent administrative organization. Five current university staff members will be allocated for major functions such as general affairs, planning, finance, research support and facilities. University staffers with a good command of English will be preferentially selected. As for the position of vice center director in charge of administration, a director-class personnel from the university will be allocated initially at the time of the center's establishment. This person will soon be replaced by a full-time vice center director, recruited from outside the university, as soon as he/she is appointed.	Kyoto University's budget policy toward the iCeMS is as follows: the university will fully fund all indirect costs related to the institute's program grant as well as all indirect costs related to competitive grants obtained by the institute's researchers. According to this policy, the institute has continued receiving funding of all indirect costs in FY 2008 as well as throughout 2009. In FY 2009 the Institute also continued to receive financial support from the university covering personnel costs for five of the PIs, as well as funding two additional full-time administrative staff members for the iCeMS and one for the CiRA. This brings the total of university funded administrative staff positions to 11.
(2) System under which the center's director is able to make substantive personnel and budget allocation decisions To ensure autonomy of the center's operation, the university takes the following measures: a) Flexible management of organization and operation system An autonomous and independent management system that plays a role equivalent to the faculty will be implemented, to ensure the center's autonomy and the center director's leadership in making decisions regarding the center's overall operation. Decisions on important matters (personnel, budget, etc.) of the center will be made by the center director through discussions with vice center directors, who assist and support the center director, in order to ensure appropriate operation. At the same time, to enable the university to provide various support and	<u>(2) System under which the center's director is able to make substantive personnel and budget allocation decisions</u> The Institute's autonomy and the leadership authority of the Director are supported by the Executive Board, consisting of the Director, Deputy Director, Chairman of the Board of PIs, and the Administrative Director. With the exception of the fact that the Director has the authority to make final decisions, the role of this board is equivalent to that of a faculty board in an academic department. There has been no change to the nature of this management structure in FY 2009. During FY 2009 the directors and senior administrators from the iCeMS and the CiRA continued to attend regular meetings chaired by the University's Executive Vice Presidents for Research and Industry-Government-Academia

advice promptly, the university president and executive vice-presidents meet the director of the center on a regular basis. b) Introduction of flexible salary system to allow researchers' easy transfers The world's leading foreign researchers, Japanese researchers who are highly recognized worldwide, and postdoctoral and other promising young researchers will be assembled at this center. For these researchers, whether from inside or outside the university, Kyoto University will allow applying a new personnel system that can appropriately reflect their achievements. To attract various researchers both from Japan and around the world, the university will accept the center director's request to implement a variety of salary payment systems. The university also introduces a flexible personnel system in which the center director can select a salary system appropriate for each researcher that will assure the maximum flexibility for researchers in transferring to the center. ・The annual salary system that the university has already introduced (a fixed-term employment contract and an annual salary system based on achievements) will be applied. ・The current salary system will be applied to the researchers while they will be allowed to concurrently remain in the original departments if approved. These systems will promote; (1) intra-university cooperation among researchers, (2) integration of different academic fields, (3) human resource development through their participation in the university's educational activities, (4) effective usage of university facilities, and (5) flexible transfer of researchers within the university. ・Salaries for foreign researchers will be paid in foreign currency of their home countries, in principle. ・For qualified technical and administrative staffers, a special employment contract will be arranged to extend a regular retirement contract. (3) Support for the center director in coordinating with other departments at host institution when recruiting researchers, while giving reasonable regard to the educational and research activities of those departments The university takes the following measures with regard to educational and research activities within the university: a) Support for researcher transfers to the center To support researchers on their smooth and flexible intra-university transfer	Collaboration (including officers from the university Administration Bureau) in order to efficiently coordinate the university's support mechanisms. The University's Executive Vice-President for Research also chairs weekly meetings attended by iCeMS and CiRA managers to closely coordinate institutional support for ongoing research. With regard to personnel affairs: • Under an initiative adopted by the University, the iCeMS employs researchers according to a discretionary labor practice with an annualized salary scale that allows the Institute to hire exemplary staff regardless of the retirement age. • The University covers the personnel costs for five iCeMS PIs. • Beginning in FY 2008, four members of the administrative staff over the mandatory retirement age have been employed according to a special discretionary hiring mechanism. Except for personnel funds from the university to cover two new PI positions at the CiRA, there have been no changes to the nature of these arrangements in FY 2009. <u>(3) Support for the director in coordinating with other departments at host institution when recruiting researchers, while giving reasonable regard to the educational and research activities of those departments</u> In FY 2009, seven iCeMS PIs continued to be affiliated with departments where they had held positions prior to joining the Institute. This dual affiliation system has allowed these PIs to continue taking part in a portion of these departments' research and graduate education programs, as well as allowing graduate students in these departments to participate in research

to the center, five (at least) principal investigator-class personnel positions will be provided so that the impacts on current educational and research activities, and administrative works will be minimized. b) Support in relation to education and research activities If approved by their original departments, researchers will be allowed to keep their research in part and education concurrently in their original departments. This will facilitate their participation in educational activities and their shared use of research facilities, equipment, and materials. This will, in turn, contribute toward more active research activities. To support the center's women researchers, the university provides effective assistance for and consultations on their research, child/nursing care, and daily lives. c) Support for foreign researchers To support foreign researchers and their families, the university prepares a handbook that explains immigration procedures, housing, the health-care system and other daily life information at the time of call for positions. Direct assistance by a foreign mentor will also be provided for a period of time immediately after their arrival in Japan. To support education for their children, a system will be established in cooperation with neighboring Doshisha University to provide them with education services at its international junior/senior high school.	taking place at the Institute. The Institute strengthened its support for foreign researchers in FY 2009 by establishing the Overseas Researchers Support Office, which aims to assist the increasing number of foreign researchers with issues regarding life in Japan. However for specific questions related to areas such as visas, housing, and schooling for family members, the Office acts as a liaison to specialists in the University administration trained in working with such matters.
(4) Revamping host institution's internal systems to allow introducing of new management methods (e.g., English-language environment, merit-based pay, top-down decision making) unfettered by conventional modes of operation The university will accept necessary system revisions for implementation of new management methods unfettered from conventional modes of operation The university establishes an autonomous and independent management organization that serves a role equivalent to that performed by the existing faculty. Important issues (personnel, budget, etc.) will be discussed and decided by the center director and vice directors, in order to ensure prompt and appropriate administrative actions. However, the center director makes decisions on the following substantive matters necessary to promote this program. ・Matters related to recruitment of foreign and Japanese researchers, and postdoctoral and other young researchers	(4) Revamping host institution's internal systems to allow introducing of new management methods (e.g., English-language environment, merit-based pay, top-down decision making) unfettered by conventional modes of operation Continuing from the previous year, approximately half of the administrative staff are fluent in English, giving the Institute the ability to communicate with researchers, issue announcements, and conduct all official events and ceremonies in English. See Section 10-2.-(2) for details of the Institute's autonomy and the Director's leadership. Matters taken up by the Executive Board include the following: • The hiring of researchers and postdocs domestically and internationally. • The adoption and modification of Institute research programs.

・Matters related to progress of research programs and evaluation of researchers' achievements ・Matters related to adoption/modification of the center's research programs ・Matters related to allocation and implementation of a budget for supporting research and operational activities of the center ・Matters related to management of research space in the center For matters that require revision of the university regulations, the executive vice-president of the university in charge will provide specific consultation, and necessary administrative procedures will be handled by the head office administration in coordination with the center administration. For administration, the university will provide several administrative personnel and necessary personnel costs while ensuring autonomy in administration. External personnel with a good command of English will also be recruited. (5) Accommodation of center's requirements for infrastructural support (facilities, e.g., laboratory space; equipment; land, etc.) a) Provision of research space necessary to conduct the world top level research It is important to establish a "globally acknowledged" center attracting top-class researchers to conduct world leading research. To this end, Kyoto University provides a high-quality research environment with the total area of about 12,000m^2 by ensuring exclusive facilities with fully equipped infrastructure. As well, the center's head office will be located on the university's main campus to make available the university's diverse facilities, including conference halls for international symposiums and other academic meetings, the university hall, library, and cafeteria. ・Center's main office space In addition to the head office functions, core facilities for the center's representative functions including research meetings, literature/academic database and information dissemination will be provided. To demonstrate autonomy of the center, a main office will be established and provided as an exclusive facility on the university main campus. ・Research project space As the main space for the center's research activities, the university provides	• The allocation and implementation of budgets for supporting the research and operations of the Institute. • The management of research space in the Institute. The Administrative Director, by concurrently acting on the Executive Boards of the iCeMS and the CiRA, is able to ensure the smooth interaction of the two institutes. There has been no change to the nature of these arrangements in FY 2009. Beginning in FY 2009, joint management meetings have been held by the iCeMS and CiRA Executive Board members, aiding their mutual efforts. Also beginning in FY 2009, monthly joint meetings have been held by iCeMS and CiRA senior administrators, enhancing their coordination. <u>(5) Accommodation of center's requirements for infrastructural support (facilities, e.g., laboratory space; equipment; land, etc.)</u> In September 2008, the first research building (iCeMS Complex 2) was completed, with approximately **2,500 m^2** of floor space. In March 2009, the iCeMS headquarters building (iCeMS Complex 1) was completed with approximately **5,000 m^2** of floor space. In September 2009, another approximately **500 m^2** of floor space in a building adjacent to the first research building (iCeMS Complex 2) was added to increase total laboratory space. In November 2010, a new building (approximately **3,000 m^2**) at Complex 2 is scheduled to be completed. Another new building of approximately **12,000 m^2** was completed in February 2010 as research space for the CiRA. With government financial support such as the supplementary budget, in FY 2009 the Institute purchased large-scale analysis equipment for stem cell sorting and gene expression profiling, as well as for research into artificial materials and new compounds.

exclusive research facilities for researchers to concentrate on their own research activities. The university also takes special efforts to provide and maintain a state-of-the-art research environment for the individual research, flexibly responding to requirements from each project over its duration. ・Space for shared research equipment To enable integrated management and operation of shared research equipment, exclusive space with technical staffers will be set up next to the research project space. ・Researchers' communication space that facilitates the exchanges among researchers from different fields In order to develop new interdisciplinary research fields through a fusion of various studies, the university provides researchers in different academic fields and from various countries with space and opportunities to enhance communications. ・Accommodation (housing) facilities for researchers Accommodation facilities will be taken care of for researchers coming from domestic and foreign areas. b) Establishment of basic facilities and equipment As a part of the process establishing the necessary research environment, the university sets up basic facilities and equipment that accompany the buildings and that need intensive initial investment along with the center's head office and basic infrastructure.	Institute buildings scheduled to be completed from FY 2008 onward are intended to serve the following purposes: • The headquarters building serves as the symbolic facility for research laboratories, seminars, and meetings, as well as acting as a central core for the Institute's literature, documents, academic data, and the dissemination of information. (iCeMS Complex 1) • Forming the core for collaborative projects and activities where the world's leading scientists engage in advanced studies, these research facilities provide an environment designed to respond flexibly to the progress of a variety of cross-disciplinary research and new collaborative projects on a long-term basis. (iCeMS Complex 1 & 2) • A place for cross-disciplinary interaction among researchers from multiple fields, including young and overseas scientists. Open-style offices and lounge areas have been built to further increase opportunities for face-to-face communication. (iCeMS Complex 1 & 2) • A space for shared equipment, adjacent to research project space, has been established. A senior manager with scientific and technical expertise has been assigned to manage daily operations of the shared equipment and devices. (iCeMS Complex 2)
(6) Support for other types of assistance As one of the leaders of the world's academic community, Kyoto University firmly determines to take a responsibility in establishing a genuine "world top-level research center" that will serve as one of "the world's leading knowledge centers". The center is expected to function as a top-level research organization since Kyoto University already has outstanding capabilities; 1) to create research environment that attracts world top level researchers, 2) to facilitate intra-university cooperation among world's leading researchers from different fields, 3) to integrate diverse academic fields to promote an interdisciplinary approach, and 4) to contribute to the present and future societies by generating unprecedented knowledge and research findings. Kyoto University is confident that with these essential	<u>(6) Support for other types of assistance</u> The iCeMS has been receiving various types of support for its operation from the university since 2007, as well as personnel and material support as stated in the "Host Institution's Commitment" in its WPI application. While working in closer cooperation with the university, the iCeMS is determined to continue to strive to become a World Premier International Research Center.

capabilities, successful performances of the center will be promised. Kyoto University has been characterized, since its foundation in1897, by an “academic atmosphere of freedom”; one that values originality and independence rather than the mere accumulation of knowledge. Located in the historic city of Kyoto, the university has developed research on diverse fields with profound originality in this unique “academic atmosphere of freedom”. Based on this historical background, it is defined in its mission statement (declared in 2001) that the ultimate goal of the university is to contribute to future sustainable human societies, featured by harmonious coexistence within human and ecological communities on this planet. This goal can be achieved by bringing forth the outstanding research and education programs in conformance with high ethical standards, and by generating world-class knowledge. We strongly believe that the best research in the world is created in the environment where the academic freedom and autonomy in research are highly valued, in this regards, Kyoto University is one of the best places to establish the world premier international research center to lead the world’s research.	

11. FY 2009 funding

i) Overall project funding

(Exchange Rate: JPY/USD=100)

Cost Items	Details	Costs (10,000 dollars)
Personnel	Center director and Administrative director	31
	Principal investigators (no. of persons):16	172
	Other researchers (no. of persons):101	494
	Research support staffs (no. of persons):53	64
	Administrative staffs (no. of persons):27	133
	Total	894
Project activities	Gratuities and honoraria paid to invited principal investigators (no. of persons):	
	Cost of dispatching scientists (no. of persons): 31	111
	Research startup cost (no. of persons): 16	214
	Cost of satellite organizations (no. of satellite organizations): 1	50
	Cost of international symposiums (no. of symposiums): 3	7
	Rental fees for facilities	9
	Cost of consumables	392
	Cost of utilities	5
	Other costs	406
	Total	1,194
Travel	Domestic travel costs	7
	Overseas travel costs	20
	Travel and accommodations cost for invited scientists (no. of domestic scientists):66 (no. of overseas scientists):71	14
	Travel cost for scientists on secondment (no. of domestic scientists):9 (no. of overseas scientists):6	5
	Total	46
Equipment	Depreciation of buildings	318
	Depreciation of equipment	1,606
	Total	1,924
Other research projects	Projects supported by other government subsidies, etc.	79
	Comissioned research projects, etc.	762
	Grants-in-Aid for Scientific Research, etc.	570
	Total	1,411
Total		5,469

Ten thousand dollars (Exchange Rate: JPY/USD=100)

WPI grant for FY 2009	**2,350**
Costs of establishing and maintaining facilities in FY 2009	**3,453**
Establishing new facilities: research building for CiRA (Number of facilities: 1, 12,000m²) Costs paid:	3,016
Establishing new facilities: rsearch building 3 at iCeMS Complex 2 (Number of facilities: 1, 3,000m²) Costs paid:	330
Repairing facilities: rsearch building 2 at iCeMS Complex 2 (Number of facilities: 1, 500m²) Costs paid:	76
Others	31
Cost of equipment procured in FY 2009	**2,486**
Stimulated Emission Depletion Spectral Fluorescence Microscope System, Number of units:1 Costs paid:	138
Two-photon excitation fluorescence inverted microscope Number of units: 1 Costs paid:	135
Transmission Electron Microscope Number of units: 1 Costs paid:	126
High–throughput ultra–high speed sequencing system Number of units: 1 Costs paid:	79
Super-Resolution Imaging Microscopy Number of units: 1 Costs paid:	74
Others	1,934

ii) Costs of Satellites and Partner institutions

(Exchange Rate: JPY/USD=100)

Cost Items	Details	Costs (10,000 dollars)
Personnel	Principal investigators (no. of persons):	
	Other researchers (no. of persons): 1	
	Research support staffs (no. of persons): 7	
	Administrative staffs (no. of persons):	
	Total	23
Project activities		7
Travel		3
Equipment		17
Other research projects		14
Total		64

12. Efforts to improve points indicated as requiring improvement in follow-up review and results of such efforts

-Points specified as needing improvement	-Efforts to improve them and results
1) Reappraisal of the proposed framework and overall strategy	1) Responding to official WPI Program Committee comments on the FY 2008 Progress Report, as well as to advice received subsequently from the PD and PO, the iCeMS Director decided after extensive deliberation with the PIs to refine the institute's research objectives, making them clearer and easier to grasp for outside observers. The new objectives are: "Meso-Control of Stem Cell Systems" and "Meso-Control of Functional Architectures." A conceptual diagram of these objectives and mutual interaction is shown in Section 1.
2) Integration of basic studies of iPS as a core research subject into iCeMS under clear relationship with CiRA	2) The President of the University and the Director of the iCeMS displayed strong initiative in working to establish the new CiRA, including submitting the necessary budget request. The iCeMS and the CiRA will continue collaboration and coordination as sister institutes for the sake of mutual benefit in basic research of stem cells. The new institute is to be officially

	established on April 1, 2010, at which point it will be free to further develop clinical applications while maintaining its basic research arm within the iCeMS. Namely, Prof **Yamanaka** will continue his basic research on iPS cells as one of the PIs within the iCeMS and concurrently will manage the CiRA as its director. Strengthening the key role that iPS/stem cell-related basic research will play within the iCeMS, the following researchers have joined the faculty: Asst Prof **Takuya Yamamoto** of the CiRA has been appointed as one of four new iCeMS Kyoto Fellows; Prof **Takashi Shinohara** of Medical School (Kyoto University) joins the adjunct faculty and strengthens stem cell research with his study of germ cell lineage stem cells; and Prof **Mitinori Saitou**, now also an adjunct professor, brings his expertise in fate determination and differentiation mechanisms of stem cells in early embryos. Also, Prof **Azim Surani**, a world leading scientist in the germ/stem cell lineage and epigenetic reprogramming research and professor at Cambridge University's Gurdon Institute, has taken up a post as visiting professor at the iCeMS.
3) Internationalization	3) The implementation of a roadmap for faculty and staff recruitment has raised the number of foreign researchers to 46 (over 30% of the total) as of March 31, 2010. An international effort to recruit young, promising researchers for the new iCeMS Kyoto Fellow positions attracted over 30 applicants, two of whom were selected from overseas for a total of four new Fellows. These scientists will establish independent research labs on par with the PIs, receiving sufficient work space and startup funds to pursue collaborative, cross-disciplinary research projects. Additionally, the Institute strengthened its support for foreign researchers in FY 2009 by establishing the Overseas Researchers Support Office, which aims to assist the increasing number of foreign researchers with issues regarding life in Japan. Seeking to achieve further internationalization, the iCeMS launched an overseas training program for young researchers, ensuring that all have an opportunity to strive to expand their horizons globally.
4) Strong leadership of the center director and the president of the university	4) As of April 1, 2010 the CiRA is slated to become a new research institute in

	the university. Thanks to the effective leadership of university President Matsumoto, opinions related to the establishment of the CiRA as an independent institute were consolidated into the final consensus on making a necessary high priority budget request to the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Under the strong leadership of the iCeMS Director, research objectives of the CiRA and the iCeMS were clearly defined according to the missions of each institute. It was also agreed to maintain and further strengthen collaboration between the two institutes. 17 researcher positions were created exclusively for foreign researchers under the iCeMS Director's initiative, as part of a continuing effort to accelerate internationalization and cross-disciplinary research at the Institute. The Director visited each PI's lab, and through intensive and candid discussions of how to advance cross-disciplinary research at the iCeMS, the PIs identified and proposed many promising projects for novel cross-disciplinary collaboration. These are included in the 28 collaboration projects shown in Section 3.