

## Summary of Proposal

Host institution name	Kyoto University
Head of host institution	Kazuo Oike, President of Kyoto University
Prospective center director	Norio Nakatsuji, Ph. D.
Prospective administrative director	Wataru Soga
Title of center project	Institute for Integrated Cell-Material Sciences
Center name	Institute for Integrated Cell-Material Sciences
Project Summary	<p>This proposal is a response to the government initiative to found world-premier research institutes to explore <i>interdisciplinary fields</i>, which will be placed within the <i>global career-development flow</i> of young scientists. We will accumulate a <i>critical mass of leading scientists for <b>the symbiotic integration of material and cell sciences</b></i> (focusing on mouse, monkey, and human pluripotent <b>stem cells</b>), based on the notion that <b><i>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</i></b>. We will achieve this goal by taking cross-disciplinary approaches, with the following inter-related targets. For basic science:</p> <p>1) Chemistry in nano-meso space in aqueous media; 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, B) drug-synthesis/controlled-release microvessels working in the body, and C) regenerative medicine based on regulated cell-material complexes.</p>
Research fields	<p>An interdisciplinary research field, spanning Biosciences, Chemistry, Material Sciences, and Physics (<a href="#">selected from the provided list of fields</a>).</p> <p>The scientific direction of this proposed Institute was conceived based on <b>TWO KEY CONCEPTS</b>. They are <b>MESO-SPACE</b> and <b>STEM CELLS</b>.</p> <p><b>(1) Meso-space is the space of 10-100 nm.</b> Between the two well-walked lands of bulk- and nano-spaces, there is the vast unexplored field of <b>meso-space</b>. 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 <b><i>the key molecular (weakly cooperative) interactions occurring in the meso-space, throughout cellular, chemical, physical, and materials sciences</i></b>. By taking interdisciplinary approaches, we will establish a <b>unified view of the molecular interactions in the meso-space in all of these fields</b>, and will develop a variety of unprecedented technologies based on the meso-scale interactions.</p> <p><b>(2) Mouse, monkey, and human pluripotent STEM CELLS</b> 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</p>

	<p>research by investigators with various backgrounds. This would enable the application to regenerative medicine using human embryonic stem (ES) cells.</p> <p>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.</p>
Research objectives	The same as those described in the “Project Summary” and “Research fields”
Outline of management	<p><b>i) Composition of administrative staff (Sentences in blue represent those in the formats)</b>  The Administration Director and the Associate Administration Director, together with administrative staff (27 members), will be hired. They together should have an experience in international scientific collaboration, as well as the knowledge on administration affairs within the Japanese national university setting. There will be six administrative sections in charge of Personnel and General Matters, Planning, Business, Intellectual Property, Public Relations and Industry Liaison, and Research Ethics and Safety. All sections will have at least two members with a good command of English.</p> <p><b>ii) Decision-making system</b>  The Center Director is responsible for all aspects of the Institute, with the aid of the Deputy-Center Director and the Administration Director. A steering committee, consisting of both scientists and non-scientists from within and outside Kyoto University, has the authority to advise the Center Director. They will meet twice a year on a regular basis as well as upon the Center Director’s request. Scientific advice will be given by the core committee, which consists of all of the Principal Investigators (see the next box).</p> <p><b>iii) Allocation of authority between the Institute and the host institution</b>  In the organizational structure of Kyoto University, this Institute will occupy a special position, freed from binding rules of the classical Japanese university archetype, to present a futuristic model of a highly authorized research institute, not only to Kyoto University but also throughout Japan and the world. For this purpose, flexible rules of a new paradigm, as for the relationships with the university headquarters, will be created. The reforms include merit-based salary, reduced duties for various committees and undergraduate education. These rules will be applied for any other foundation of research institutes within Kyoto University in the future. Although the Center Director will report directly to the President of Kyoto University and the Executive Board Member in charge of research and education, the Institute will basically be run autonomously.</p>
Researchers and other center staffs	<p>Twenty (20) Principal Investigators (PIs)  (including three from abroad and one located at a satellite location)  Total of 135 Investigators (including 40 investigators from abroad)  Total of 250 members (as of 2009.4)  Principal Investigators (20)  From Kyoto University (13)  Norio Nakatsuji, Center Director  (Institute for Frontier Medical Sciences, Stem-Cell Biology, 57)  Susumu Kitagawa, Co-Center Director  (Graduate School of Engineering, Inorganic Chemistry, 56)  Motonari Uesugi (Institute for Chemical Research, Chemical Biology, 40)  Koichiro Tanaka (Graduate School of Science, Terahertz Optical Physics, 44)  Shinya Yamanaka (Institute for Frontier Medical Sciences, Stem-Cell Biology, 45)  Hiroshi Imahori (Graduate School of Engineering, Photochemistry, 46)  Hiroshi Sugiyama (Graduate School of Science, Gene Chemistry, 51)  Kazumitsu Ueda (Graduate School of Agriculture, Cellular Biochemistry, 53)  Akihiro Kusumi (Institute for Frontier Med. Sci., Single-Molecule Nanobiology, 54)  Mitsuru Hashida (Graduate School of Pharm. Sci., Drug Delivery/Targeting, 56)  Kiyoshi Tomioka (Graduate School of Pharm. Sci., Medicinal Chemistry, 59)  Tamio Hayashi (Graduate School of Science, Synthetic Organic Chemistry, 59)</p>

	<p>Mikio Takano (Institute for Chemical Research, Solid-State Chemistry, 63)  From other institutes (6 including 3 non-Japanese scientists, 1 Japanese to be announced)</p> <p>Takashi Hiiragi (Max-Planck Institute, Münster, Developmental Biology, 39)  Yoshie Harada (Tokyo Metropol. Inst. of Med. Sci., Single-Molecule Physiology, 47)  Konstantin Agladze (George Washington University, Biophysics, 51)  Yong Chen (Ecole Normale Supérieure, CNRS, Nanotechnology, 50)  John Heuser (Washington University, School of Medicine., Biophysics, 65)  Principal Investigator at the satellite institute (1: Faculty of Appl. Biol. Sci., Gifu Univ.)  Makoto Kiso (Faculty of Appl. Biol. Sci., Gifu University, Bio-Organic Chemistry, 60)</p> <p><b>#To make this Institute an attractive center that provides a career path for young investigators around the globe, the independent Super Postdoc positions will be offered with an annual salary and a research fund (a type of Career Development Award). These will be independent positions, but an awardee will choose a mentor, from among the PIs, to help him/her out.</b></p>
<p>Outline of research environment</p>	<p><b>1)</b> To minimize the administrative workload of the researchers, the administration office will be adequately staffed with qualified workers. <b>2)</b> Start-up funds for researchers from other institutions will be guaranteed by the Institute and Kyoto University. <b>3)</b> All positions will be disclosed and advertised internationally. <b>4)</b> The official language will be English, for both research and administration. <b>5)</b> Official evaluations for the Institute and the members will be conducted in the years 3, 5, 8, and 10 by an international committee, and the results will be used for determining the salary levels. <b>6)</b> Kyoto University will provide office and lab spaces, and a research environment suitable for a first-class research institute. <b>7)</b> International Symposia to promote the Integrated Cell-Material Sciences will be held at least twice a year, inviting world leaders from related fields.</p>
<p>Outline of indicators for evaluating a center's global standing</p>	<p>An evaluation committee consisting of both domestic and international members will evaluate the Institute based on the following five criteria.</p> <p>(1) Have the individual investigators carried out research that could impact the field?  (2) Have the individual investigators originally from different disciplines worked collaboratively to produce important results?  (3) Has the administration properly supported the investigators, in a manner suitable for a premier international research center?  (4) Has the Institute become recognized by researchers around the globe as an excellent place for young investigators to establish their career paths?  (5) Has the Institute sufficiently promoted the interactions with researchers from the eastern and Asian countries?</p>
<p>Securing research funding</p>	<p>In addition to the funds from this program, we expect to obtain extramural supports which researchers will procure, and active supports from Kyoto University for institute's expenses.</p>
<p>Summary of host institution's commitment</p>	<p><b>(1)</b> Kyoto University will provide the Institute with buildings located near the "International Zone of the university", where Institut Franco-Japonais du Kansai, Centro Culturale Italo Giapponese di Kyoto, and Göthe-Institut Kyoto are located, i.e., the buildings that previously housed the Institute for Research in Humanities and the Engineering Bldg. 9, plus the Sub-Center lab at the Institute for Frontier Medical Sciences (animal and ES cell facilities). In addition, the following supports will be provided by Kyoto University.</p> <p>(1) Anti-vibration (earthquake) retrofitting of the buildings and remodeling for the laboratory. (2) Most of the utility bills and building maintenance expenses.</p> <p><b>(2)</b> Kyoto University will provide at least five principal investigator-class positions. Also, it will cover the salary for the PIs from Kyoto University, as well as necessary means to fill the vacancies within the former departments of PIs. PIs will keep affiliation with their former departments for graduate education.</p> <p><b>(3)</b> As for the administration, Kyoto University provides the full-time administrative staff and necessary personnel expenses in order to establish an independent administrative organization.</p> <p><b>(4)</b> Kyoto University will provide the Center Director's discretionary fund.</p>

## Research Center Project

Host institution name	Kyoto University
Head of host institution	Professor Kazuo Oike, Ph. D., President of Kyoto University
Title of center project	Institute for Integrated Cell-Material Sciences
Center name	Institute for Integrated Cell-Material Sciences
Project summary	<p>1. Overview</p> <p>Our new institute, iCeMS, aims to become a world-premier research institute to create interdisciplinary fields, which will be placed within the global career-development flow of young scientists. Leading scientists will gather in Kyoto and work together for the synergistic integration of cell and material sciences, including chemistry, physics and cell biology and focusing on pluripotent stem (ES and iPS) cells and meso-control, 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.</p> <p>We will take cross-disciplinary approaches to create following new science fields and their applications. We will create 1) new chemistry and physics of meso-space, 2) cellular meso-biophysics, and 3) stem-cell control by meso-engineering.</p> <p>Furthermore, we will contribute to human wellness by developing A) environmentally-friendly chemistry by meso-control, B) detoxication and drug synthesis in the body, and C) regenerative medicine by controlling stem cells with smart materials.</p> <p>Also, we are going to create novel management system and the following new initiatives in our iCeMS, so that it will be able to serve as a model for global premier research centers in Japan.</p> <p>1) Kyoto iCeMS Fellows (independent superpostdocs): International advertisement and searching will create a global career hub for the best and brightest among very young researchers.</p> <p>2) Common-use laboratories and open offices will remove physical and mental walls between research groups and enable flexible allocation of research spaces, thus promoting cross-disciplinary research through collaboration of researchers from different fields.</p> <p>3) Special supports for nurturing and promoting female researchers to top-level scientists.</p> <p>2. Purpose and Mission of the iCeMS</p> <p>Our project is a response to the Japanese government initiative to found world-premier international research centers, (1) to explore interdisciplinary research fields, and (2) to place themselves within the global career-development flow of top scientists in their own generations.</p>

To address the first point, “to explore interdisciplinary field”, the proposed institute aims to attain a critical mass of leading scientists for the creation of a new research field, “the Integrated Cell-Material Sciences”. This is based on the notion that the fundamental understanding and control of molecular complexes in the meso-space of 10-100 nm is critical for creating the science and technology of the next generation.

Therefore, meso-space is one of the two key concepts in this proposal. Meso-space is greater than the nano-space, which nanotechnology and molecular biology have extensively explored. It is smaller than the bulk space greater than 1 micron, where there are sufficient numbers of molecules for ensemble averaging. Between these two well-traveled lands, there is the vast unexplored land of meso-space of 10-100 nm. Although molecular, atomic, and ionic interactions occurring in nano-space are interesting subject of research, they are generally elementary processes. Non-linear, weakly-cooperative events, which present challenging problems and can be the seeds for the tomorrow’s technology, take place in meso-space.

Using the notion of meso-space, the biological and non-biological worlds can be united to learn from each other, and to elucidate the physical and chemical processes characteristic of meso-space, including the formation and functional mechanisms of the meso-scale molecular complexes in the cell. We envisage that such a study would develop a new realm of science and technology, in the cross-disciplinary field of biosciences, physics, chemistry, and materials science.

The second key concept is the stem cells. Since we will be a group of investigators with a variety of backgrounds, standardized paradigm for studying the cell must be established. This is indispensable for fostering collaborative research, by enhancing the ease of sharing knowledge on cells, biological tools, samples, and communication among researchers working in different fields in this Institute. For this purpose, all of the PIs will use pluripotent stem cells, either embryonic or artificially-induced pluripotent stem cells. These cells grow rapidly; their genes can be manipulated easily, and then with the same manipulated genes, they can be differentiated into various cell lineages. Therefore, using pluripotent stem cells for the research would accelerate the development of regenerative treatments.

To address the second point of this government initiative, “to place itself within the global career-development flow of young scientists”, I would like to express my strong personal belief in Japanese science. The most critical problem with Japanese science is its exclusion from the global career-development flow of young scientists. Without attracting the best and brightest young researchers to Japan, and having some of them stay in Japan, Japanese science would lag behind that in other developed countries. In the first sentence of the call for the application, from the Program Committee of the World Premier International Research Center (WPI) Initiative, it was stated as “we will need to position ourselves within the global flow of outstanding human resources while creating research platforms that will naturally attract and

amass such human resources in Japan.”

### 3. Administration Programs and Goals

We will run the proposed Institute as a future-model-institute at Kyoto University and in Japan. In the organizational structure of Kyoto University, this Institute will occupy a special position, freed from many binding rules of archetypical Japanese universities, and flexible management rules will be introduced. Although the Director will report directly to the President of Kyoto University, the Institute’s autonomy and the Director’s leadership in making decisions on the overall operation of the Institute will be ensured.

The followings are examples of our novel administration policy. 1) English will be used as the official language. 2) Swift decisions will be made by the Director. Major decisions will be made by the Director with the aid of the executive board of the Institute. 3) A merit-based salary system will be introduced. 4) Open positions for scientists will be disclosed and advertised internationally. 5) Start-up funds for researchers from other institutions will be provided.

In addition, we are going to create special programs for our iCeMS. Given the geographical, linguistic, and cultural barriers of Japan, even the best institutions in Japan carrying out top-level research may have difficulty attracting scientists from abroad to work at their institutions. To improve this situation, the Institute will additionally implement the following programs and strategies.

1) A career-development superpostdoc system: Kyoto iCeMS Fellow Award : We will create a career-development superpostdoc system, called “Kyoto iCeMS Fellow.” This is a program to provide great resources and autonomy for talented young researchers for their scientific development. Candidates will be selected from the international pool of excellent scientists who have recently acquired their doctoral degrees. The successful applicants will be awarded 5 years of salary, together with funds to run small, independent research groups. Since these excellent young scientists will eventually move on to the next phase of their illustrious international careers, the Institute’s role and reputation as a prominent global scientific center will be widely acknowledged.

2) Common-use laboratories and open offices: Physical distance among research groups will be reduced to encourage interactions and collaborations on daily basis, which would eventually contribute to making major scientific breakthroughs. To enhance the communication among researchers, the iCeMS will provide common-use laboratories with bench space allocated among all of the research groups, including groups led by the Kyoto iCeMS Fellows. The space allocation to each PI will be merit-based, and this could be instituted more easily with such flexible allocation in the common-use laboratories.

3) Scientific integrity and science communication program: Although science and technology have greatly contributed to the advancement of

human health and welfare, we are also aware of society's concerns for the inadequate progress of science and technology. Some of these concerns may be groundless, but might have been inspired by the words and deeds of the scientists who lack scientific integrity. Another reason for the public concern may be due to the lack of communication from the scientists' side, to provide informed lay individuals adequate and balanced information about science and technology. We will initiate a program to educate scientists on scientific integrity and ways to communicate with society.

## Institute for Integrated Cell-Material Sciences

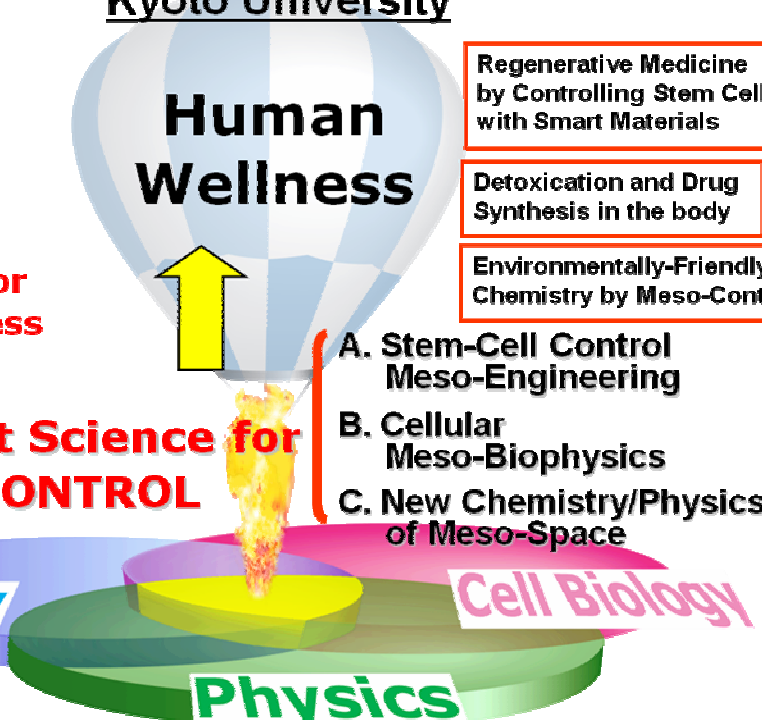


Meso-Control Stem Cells

**Lifting off  
Innovative  
Applications for  
Human Wellness**

**Create  
New Hot Science for  
MESO-CONTROL**

**Chemistry**



**Regenerative Medicine  
by Controlling Stem Cells  
with Smart Materials**

**Detoxication and Drug  
Synthesis in the body**

**Environmentally-Friendly  
Chemistry by Meso-Control**

**A. Stem-Cell Control  
Meso-Engineering**

**B. Cellular  
Meso-Biophysics**

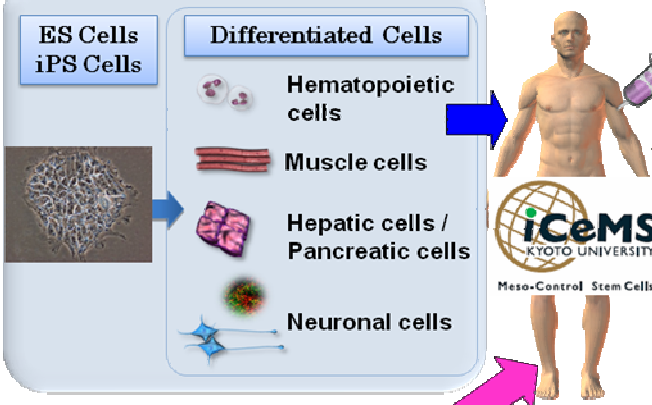
**C. New Chemistry/Physics  
of Meso-Space**

**Cell Biology**

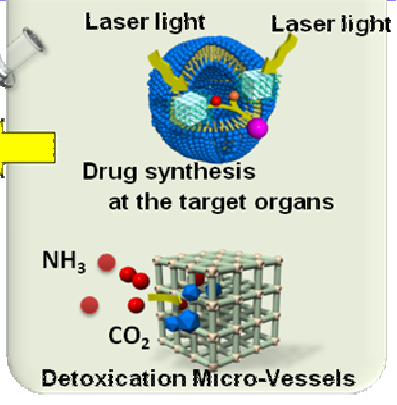
**Physics**

# Contributing to Human Wellness in Three Areas

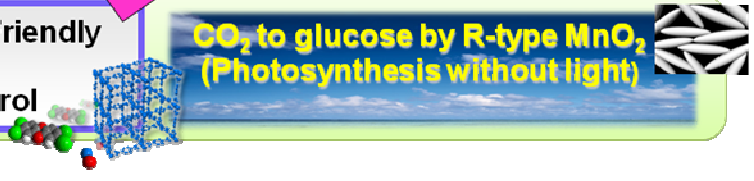
## Regenerative Medicine by Controlling Stem Cells with Smart Materials



## Detoxication and Drug Synthesis in the Body



## Environmentally-Friendly Chemistry by Meso-Control





## Center Director's Vision

### **Statement of my View for the Proposed “Institute for Integrated Cell-Material Sciences” a World Premier International Research Center**

Center Director

**Norio Nakatsuji, Ph. D.**

Professor and Director

Institute for Integrated Cell-Material Sciences

Kyoto University

### **Forewords**

This proposal is a response to the Japanese government initiative to found world-premier international research centers, (1) to explore interdisciplinary research fields, and (2) to place themselves within the global career-development flow of top scientists in their own generations.

**To address the first point**, “to explore interdisciplinary field”, the proposed institute aims to attain a critical mass of leading scientists for **the creation of a new research field, “the Integrated Cell-Material Sciences”**. This is based on the notion that **the fundamental understanding and control of molecular complexes in THE MESO-SPACE OF 10-100 NM is critical for creating the science and technology of the next generation.**

**Therefore, MESO-SPACE is one of the two key concepts in this proposal.**

Meso-space is greater than the nano-space of 1-10 nm, which nanotechnology and molecular biology have extensively explored. It is smaller than the bulk space greater than 1 micron, where there are sufficient numbers of molecules for ensemble averaging. Between these two well-traveled lands, there is the vast unexplored land of meso-space of 10-100 nm. Although molecular, atomic, and

ionic interactions occurring in nano-space are interesting subject of research, they are generally elementary processes. Non-linear, weakly-cooperative events, which present challenging problems and can be the seeds for the tomorrow's technology, take place in meso-space.

Using the notion of meso-space, the biological and non-biological worlds can be united to learn from each other, and to elucidate the physical and chemical processes characteristic of meso-space, including the formation and functional mechanisms of the meso-scale molecular complexes in the cell. As detailed in the later sections of this statement, we envisage that such a study would develop a new realm of science and technology, in the cross-disciplinary field of biosciences, physics, chemistry, and materials science.

**The second key concept is the STEM CELL.** Since we will be a group of investigators with a variety of backgrounds, standardized paradigm for studying the cell must be established. This is indispensable for fostering collaborative research, by enhancing the ease of sharing knowledge on cells, biological tools, samples, and communication among researchers working in different fields in this Institute. For this purpose, all of the PIs will use pluripotent stem cells, either embryonic or artificially-induced (one of the PIs for this proposal, Dr. Shinya Yamanaka, was the first to produce such a cell line; Cell 2006, Nature 2007). These cells grow rapidly (1000-fold within a week for mouse ES cells); their genes can be manipulated easily, and then with the same manipulated genes, they can be differentiated into various cell lineages. Therefore, using pluripotent stem cells for the research would accelerate the development of regenerative treatments.

**To address the second point of this government initiative,** "to place itself within the global career-development flow of young scientists", I would like to express my strong personal belief in Japanese science. The most critical

problem with Japanese science is its exclusion from the global career-development flow of young scientists. Without attracting the best and brightest young researchers to Japan, and having some of them stay in Japan, Japanese science would lag behind that in other developed countries. This problem could be much more serious problem than the one about years of government underspending on scientific research.

**In the first sentence of the call for the application, from the Program Committee of the World Premier International Research Center (WPI) Initiative**, it was stated as “we will need to position ourselves within the global flow of outstanding human resources while creating research platforms that will naturally attract and amass such human resources in Japan.” This is exactly what I have been considering for a long time, and because of this statement, I have decided to contribute to this proposed Institute and to commit as the Center Director.

Therefore, **I have organized this Statement of my View for this proposed Institute IN AN UNUSUAL WAY**. Although I am strongly confident that scientific content of our proposal is outstanding, and would appeal to bright young scientists around the world, I would like to begin this statement by explaining the administrative programs, systems, and reforms that will take place in this Institute. In addition to the science conducted in this Institute, these new programs and reforms would make this Institute more attractive to the foreign researchers, and make scientists from abroad free from general stumbling blocks of cumbersome administrative procedures, worry for the start-up fund, and linguistic barriers. I will also explain how this proposed Institute could work as a beach head to revolutionize the administration archetype of Japanese Universities.

## **I. Administration Programs and Goals**

We will run the proposed Institute as a future-model-institute at Kyoto University and in Japan. In the organizational structure of Kyoto University, this Institute will occupy a special position, freed from many binding rules of archetypical Japanese universities, and flexible management rules will be introduced, as described below. It will have minimal hierarchical layers so that information flow and decision making processes will be facilitated, both in the administration offices and in the laboratories. These rules will be applied for the foundation of other research institutes within Kyoto University in the future. Although the Center Director will report directly to the President of Kyoto University and the Executive Board Member in charge of research and education, the Institute's autonomy and the Center Director's leadership in making decisions on the overall operation of the Institute will still be ensured.

### **[1] Compliance with all of the recommendations made by this government initiative**

I totally agree with the recommendations made by the program committee for this government initiative. Therefore, all the recommendations will be entirely implemented in our Institute, at much higher levels than those anticipated by the committee. Here is the list. (For the reviewers from abroad, the emphasis on these points may sound strange, because these points might be quite usual to them, but these are all new to the Japanese university system, and some of them are totally unheard of in Japanese universities.)

1. English will be used on all occasions, in all of the meetings and documents, including e-mail announcements. Two members in each section of the administrative office will be fluent in English. However, what will happen if the researchers cannot communicate with the lab technicians in the lab? Importantly, in the international and academic environment of the city of Kyoto, the

concentration of laboratory technicians who can communicate well in English is very high. Quite a few technicians have had the experience of working outside of Japan as laboratory technicians. In many cases, they are married to Japanese researchers, who worked in overseas laboratories, and they also chose to work there. Many laboratory technicians working at Kyoto University have Master of Science degrees.

2. Swift decisions will be made by the Center director. Major decisions, including the level of the Institute's support (funding) and the space allocation for each PI, will be made by the Center Director with the aid of the executive board of the Institute, consisting of the Center Director, the Deputy Center-Director, and the Administration Director.

3. Steering and evaluation committees, consisting of a group of learned individuals from both outside and within the University, will be established.

4. A merit-based salary system will be introduced. The salaries of the investigators transferred within Kyoto University will be paid directly by Kyoto University, according to its rules. However, merit-based compensation, in the form of a bonus, will be introduced. In parallel, a total merit-based annual salary system will be implemented for researchers relocating from outside the host institution. Rigorous, objective evaluations will be conducted by the Evaluation Committee. Based on the report from the Evaluation Committee, the final evaluation will be given by the Center Director, with the help of the Center Executive Board and the Steering Committee.

5. All positions will be disclosed and advertised internationally.

6. The principal investigators (PIs) are professors of Kyoto University, but will be freed from all of the duties for various committees and undergraduate education.

7. International Symposia to promote the Integrated Cell-Material Sciences will be held at least twice a year, inviting world leaders from related fields.

8. To minimize the researchers' administrative workload, the administration

office will be adequately staffed with qualified personnel.

9. Start-up funds for researchers from other institutions will be guaranteed by the Institute and Kyoto University.

## **[2] Special programs instituted in the proposed Institute**

Given the geographical, linguistic, and cultural barriers of Japan, even the best institutions in Japan carrying out top-level research may have difficulty attracting scientists from abroad to work at their institutions. To improve this situation, the Institute will additionally implement the following programs and strategies.

### **[2A] A career-development superpostdoc system: Kyoto iCeMS Fellow Award**

We will create a **career-development superpostdoc system**, called “Kyoto Integrated Cell-Material Sciences Fellow” or “**Kyoto iCeMS Fellow**” at a cost of 2.6-million-USD/year. This is a program to provide great resources, autonomy, and accountability for talented young researchers for their scientific development. They will have free access to equipment and facilities in affiliated departments, as well as in any PI’s laboratory and the shared-instrumentation laboratory in the Institute. Therefore, with this budget, we will have about 8 Fellows working in our Institute at any one time. Candidates will be selected from the international pool of excellent scientists who have recently acquired their doctoral degrees. This career phase is the prime period for ambitious scientific challenges based on fresh and original ideas. The successful applicants will be awarded 5 years of salary (70-100 k USD/year), together with funds to run small, independent research groups (100-300 k USD/year for supplies, technician’s salary etc.). They will also have opportunities to supervise graduate students. Since these excellent young scientists will eventually move on to the next phase of their

illustrious international careers, the Institute's role and reputation as a prominent global scientific center will be widely acknowledged.

**[2B] The Institute funds set aside for supporting long-term and short-term visiting scientists and graduate students**

Apart from the funds for international symposia held twice a year, we set aside half million USD (60 million Japanese yen) per year for inviting long-term and short-term visiting scientists and graduate students.

**[2C] Common-use laboratories**

Physical distance among research groups will be reduced to encourage interactions and collaborations on daily basis, which would eventually contribute to making major scientific breakthroughs. To enhance the communication among researchers, the Institute will provide common-use laboratories with bench space allocated among all of the research groups, including groups led by Super-Postdocs or Kyoto iCeMS Fellows. Moreover, the additional space at common-use laboratories will allow flexibility to meet the changing needs and size of each group. The space allocation to each PI will be merit-based, and this could be instituted more easily with such flexible allocation in the common-use laboratories.

**[2D] Model mentor development program**

The importance of finding a mentor early in the career for scientists is very well known, but the necessity for cultivating competent mentors is rarely discussed. Though it may be true that the greatest mentors are born with qualities, but the skills of professors and PIs for mentoring could be greatly improved by proper education.

We plan to set up an educational program in the Institute, inviting world

prominent scientists who are working in the fields related to the Integrated Cell-Material Sciences and are known to be excellent mentors. The main feature here is to invite their previous students and postdocs at the same time. This would provide interesting opportunities to learn about mentorship while participating in interesting scientific sessions. The mentoring session will be open to any of the scientists and professors in Japan and more.

### **[2E] Model Scientific integrity and communication program**

Although science and technology have greatly contributed to the advancement of human health and welfare, we are also aware of society's concerns for the inadequate progress of science and technology. Some of these concerns may be groundless, but might have been inspired by the words and deeds of the scientists who lack scientific integrity.

Another reason for the public concern may be due to the lack of communication from the scientists' side, to provide informed lay individuals adequate and balanced information about science and technology.

We will initiate a program to educate scientists on scientific integrity and ways to communicate with society, in collaboration with Assoc. Prof. Kazuto Kato from the Institute for Research in Humanities at Kyoto University. He was originally trained as a developmental biologist (Ph.D. from Kyoto University), and after completing postdoctoral research, he started working on the subjects of science communication and ethics. He will help us and we start this program by first inviting prominent scholars in this field, journalists, and other informed individuals interested in these aspects of science. This Institute, with its cross-disciplinary scientific capabilities, will be an ideal institution as an advocate to speak for scientific integrity as well as to enhance communication with society.



# Host Institution's Commitment

Date October 1,2007

To MEXT

Name of host institution  
Name and title of head of host institution

Kyoto University  
Kazuo Oike, President  
Signature

I confirm that the measures listed below will be taken faithfully if "(project title)" is adopted under the World Premier International Research Center (WPI) Initiative.

## <Provision in host institution's mid-to-long-term plan>

- Describe clearly the host institution's mid-to-long-term strategy plan and how the center is positioned within that strategy.

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.

## <Concrete Measures>

- Describe the concrete measures that the host institution will take to satisfy the following requirements.

- (1) How it will support the center's need to secure resources that match or exceed the project grant through such means as competitive grants obtained by researchers participating in the project, in-kind contributions and other forms of assistance by the host institution ( including partial payment of salaries, provision of research space), and/or external donations.

To secure resources for center operation and research activities, the university takes the following measures:

- a) Provision of expenses of infrastructure to support the center's operation  
As a necessary financial measure for the center's operation, the university provides indirect costs related to this program by the associated overheads as well as by the ones associated with competitive grants obtained by the center's researchers. Infrastructure costs including building maintenance and utility fees will be allocated from the university budget. In addition, we will provide, with an appropriate measure, fundamental research grants for young researchers.
- b) Support in obtaining external funds such as competitive grants  
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.

c) Support for center management to attract world top-level researchers

1) Provision of personnel expenses

**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.

2) Provision of research space

**Kyoto University provides a high-quality research environment with the total area of about 12,000m<sup>2</sup> by ensuring exclusive facilities with fully equipped infrastructure. Details are described in the following section (5-a).**

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.

(2)How it will institute a system under which the center's director is able to make substantive personnel and budget allocation decisions necessary to implementing the center project—a system, which in practice, allows the center director autonomy in making decisions regarding the center's operation.

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 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

(1) 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)The support it will provide to the center director in coordinating with other departments within the host institution when recruiting researchers for the center, 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 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.**

(4)Its flexibility in applying, revising, or supplementing the host institution's internal systems as needed for the center to effectively implement 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
- 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.

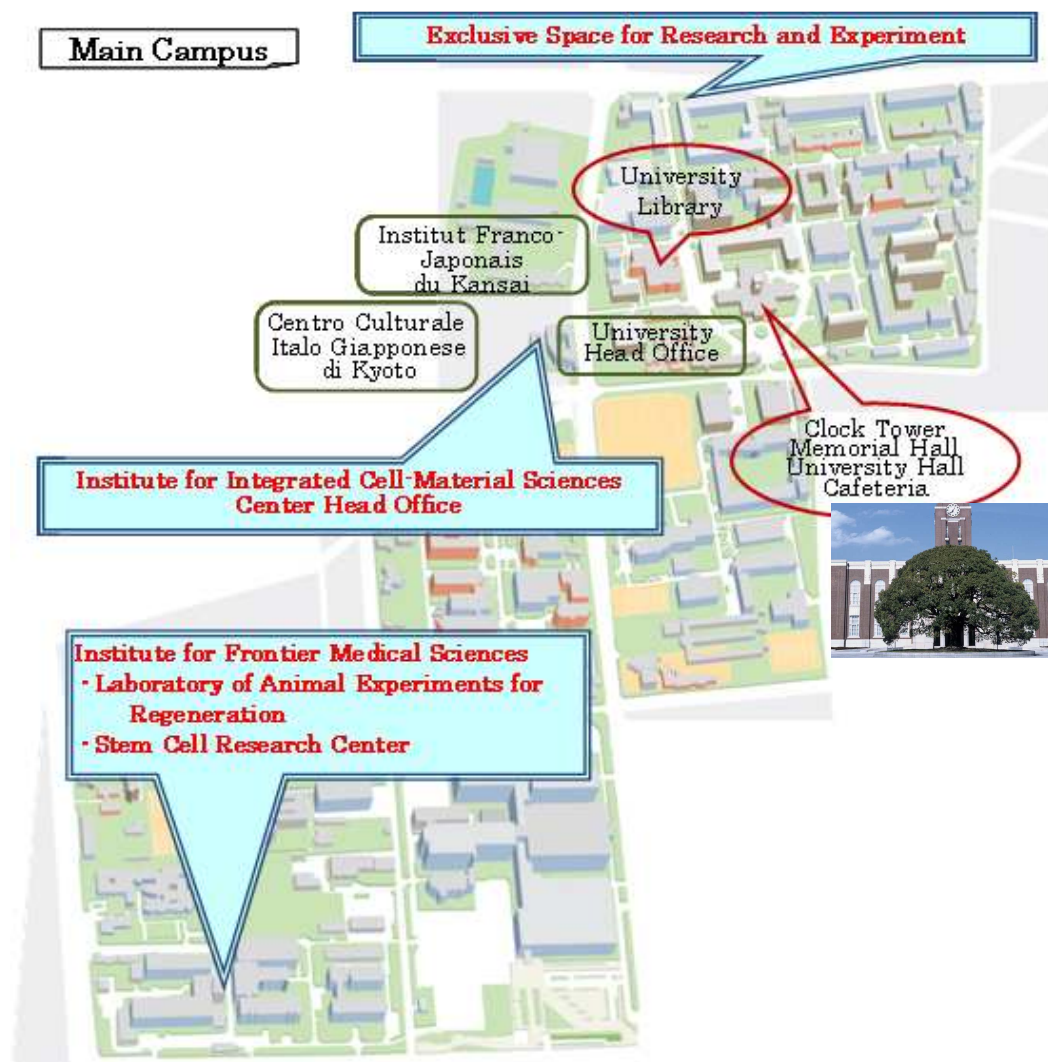
- (5) Its accommodation of the center's infrastructural requirements (for facilities, e.g., laboratory space; equipment; land, etc.).

#### Accommodation of infrastructure requirements

- 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<sup>2</sup> 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 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.

(6) Other types of assistance it will provide to give maximum support to the center in achieving its concepts and objectives and becoming a world premier international research center in both name and deed.

Other measures:

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 capabilities, successful performances of the center will be promised.

Kyoto University has been characterized, since its foundation in 1897, 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.

## List of Principal Investigators

Name	Previous affiliation (organization, department) and specialties	Academic degree
① Norio Nakatsuji	Kyoto University, Institute for Frontier Medical Sciences, Stem-Cell Biology	Ph.D
② Susumu Kitagawa	Kyoto University, Department of Synthetic Chemistry and Biological Chemistry, Graduate School of Engineering, Inorganic Chemistry	Ph.D
③ Takashi Hiiragi	Max-Planck Institute for Molecular Biomedicine, Mammalian Development, Developmental Biology	M.D. & Ph.D
④ Motonari Uesugi	Kyoto University, Institute for Chemical Research, Chemical Biology	Ph.D
⑤ Koichiro Tanaka	Kyoto University, Department of Physics, Terahertz Optical Science	Ph.D
⑥ Shinya Yamanaka	Kyoto University, Department of Stem Cell Biology, Institute for Frontier Medical Sciences, Stem-Cell Biology	M.D. & Ph.D
⑦ Hiroshi Imahori	Kyoto University, Department of Molecular Engineering, Graduate School of Engineering, Photochemistry	Ph.D
⑧ Yoshie Harada	Tokyo Metropolitan Organization for Medical Research, The Tokyo Metropolitan Institute of Medical Science, Single-molecule physiology	Ph. D
⑨ Yong Chen	Ecole Normale Supérieure CNRS Research director, Biophysics	Ph.D

⑩ Hiroshi Sugiyama	Kyoto University, Department of Chemistry, Chemical Biology	Ph.D
⑪ Agladze, Konstantin	George Washington University, Department of Pharmacology and Physiology, Biophysics	Ph.D
⑫ Kazumitsu Ueda	Kyoto University, Vice Dean of Graduate School of Agriculture, Cellular Biochemistry	Ph. D
⑬ Akihiro Kusumi	Kyoto University, Institute for Frontier Medical Sciences, Single-Molecule Nanobiology	Ph.D
⑭ Mitsuru Hashida	Kyoto University, Department of Drug Delivery Research, Graduate School of Pharmaceutical Sciences, Biopharmaceutics	Ph.D
⑮ Tamio Hayashi	Kyoto University, Department of Chemistry, Graduate School of Science, Organic Chemistry	Ph.D
⑯ Kiyoshi Tomioka	Kyoto University, Graduate School of Pharmaceutical Sciences, Organic Chemistry	Ph.D
⑰ Mikio Takano	Kyoto University, Institute for Chemical Research, Solid State Chemistry	Ph.D
⑱ John Heuser	Washington University School of Medicine	M.D. & Ph.D
⑲ Makoto Kiso	Gifu University, Department of Applied Bio-organic Chemistry, Glycotechnology	Ph.D
⑳ under consideration		