

# Application for Academy Center Certification World Premier International Research Center Initiative (WPI)

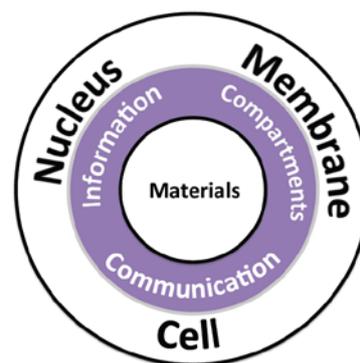
Host Institution	Kyoto University
Research Center	Institute for Integrated Cell-Material Sciences (iCeMS)
Host Institution Head	Juichi Yamagiwa
Center Director	Susumu Kitagawa
Administrative Director	Mitsuru Hashida

Please prepare this application based on the content of your center's progress report and the progress plan you submitted for the center's final evaluation. Summarize the center's future plans with regard to the following 6 items within three A-4 pages. (Also fill out the appendices at the end of this form.)

## 1. Overall Image of Your Center

\* Describe the Center's overall image including its current identity.

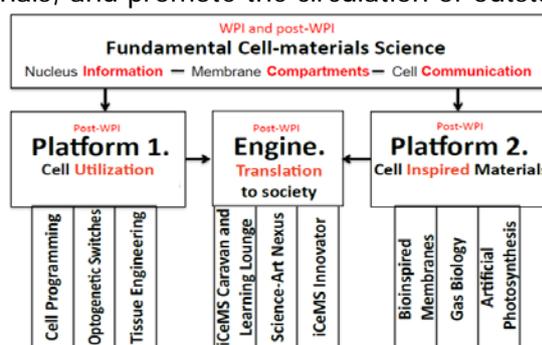
iCeMS, founded in 2007 in line with the WPI program, gathered an exceptional collection of internationally known cell biologists, material scientists and chemical biologists from Kyoto University, from Japan and from around the globe. These eminent researchers who gathered at iCeMS, all motivated by its difficult but rewarding challenge, were given the freedom to define, through their collaborations, the framework of what a new interdisciplinary movement would like. The iCeMS leadership of Prof. Susumu Kitagawa, a world-class leader in material science, facilitated the dialogue on even ground among its researchers in the two major fields of cell biology and material science. This allowed iCeMS to identify its core values in the last 10 years, which resulted in the determination of its final goal as creation of "Materials for Cell Elucidation and Control". In order to achieve this goal, iCeMS concentrates on the study of three essential properties of cells and cell biology: Cell Communication; Nucleus Information; and Membrane Compartments. Also, now being a research institute of the Kyoto University Institute for Advanced Study (KUIAS), iCeMS undertakes important roles to further advance its cutting-edge research capitalizing on the strengths of Kyoto University, cultivate the next generation of research professionals, and promote the circulation of outstanding research talent both within Japan and overseas.



## 2. Research Activities

\* Describe how the center will challenge new research fields and adopt new strategies.

True integration of cell and material sciences should be bidirectional, making ground-breaking contributions to both cell biology and material sciences. iCeMS will achieve such true



integration through two platform concepts of “Utilization of cells” and “Inspiration to materials”, and also through an engine for its “Translation to society”.

- **Platform 1. Synthetic paradigms for cell programming and its utilization**  
iCeMS will continue its research for the development of new materials chemistries and technologies to monitor and control differentiation of stem cells into functional cells and tissues.
- **Platform 2. Breathing, cleansing and transformation through cell-inspired materials**  
iCeMS will strive to generate Smart Materials with functionalities equivalent to those of membrane compartments in living cells, which simultaneously “select” and “condense” molecules, and will seek their application in the fields of medicine, energy and environment.
- **Translation Engine. A crucible for creativity**  
iCeMS will further enhance its public relations effort in order to convey its research results, achieved through the two platforms mentioned above, to a broader part of society in a more comprehensible manner.

### 3. System for Managing the Research Organization

\* Describe the research organization and management system that the center will use to carry out the research strategy and plan described above.

\* In Appendix 1-3, list the Principle Investigators, enter the number of center personnel, and provide a diagram of the center's management system.

For the sake of research objectives and strategies mentioned in 2 above, iCeMS' team of principal investigators (PIs) has been reorganized as shown in Appendix 1. Suzuki, Horike and Tamanoi have been employed as PIs from outside iCeMS, while young talented researchers (Furukawa, Kamei, Hirori, Sugimura and Hasegawa) have been newly appointed to PIs. iCeMS also maintains some world-renowned professors within Kyoto University as its adjunct PIs.

Meanwhile, Kyoto University entered into a basic agreement with RIKEN in June 2016 to seek comprehensive partnership and cooperation. Preparation of collaborative projects is currently under way with KUIAS as a key player, in order to promote frontier research in a research environment/system achievable by neither of the two institutions alone, and also to develop future human resources. In addition, the AIST-Kyoto University Chemical Energy Materials Open Innovation Laboratory (ChEM-OIL) was established in April 2017 as a new collaborative research center of KUIAS. Through this fusion of iCeMS' world-leading basic research of cutting-edge materials and the applied research of device chemistry conducted by the National Institute of Advanced Industrial Science and Technology (AIST), Kyoto University implements various new approaches, including those to the development of non-conventional technologies for energy conversion and storage, based on the organization management system cultivated at iCeMS.

### 4. International Circulation of Best Brains

\* Describe your policy and concrete plan for promoting the international circulation of the world's best brains, which is an important function of the WPI Academy.

#### 4-1. Policy for international circulation of best brains

Through international symposiums and joint research projects with overseas institutes, iCeMS will encourage active exchanges among researchers to promote creation of international research networks and a rise in global competitiveness of young researchers. Support systems will be established for the planning and implementation of policy measures.

#### 4-2. Concrete measures to promote international circulation of best brains

Below are measures to be taken by iCeMS to shape its policy for international circulation of

best brains.

#### **4-2-1. iCeMS “Young Researcher Internationalization Program to Promote World Premier International Research Center Initiative”**

Opportunities for overseas education and research will be provided to young researchers, so that they will strengthen their global competitiveness and establish research networks through discussions with overseas researchers.

#### **4-2-2. Introduction of cross-appointment scheme**

The cross-appointment scheme, which started with Prof. Tamanoi of UCLA employed as PI last year, will continue to be used for hiring excellent researchers of overseas universities to facilitate joint research and internationalization of research environment.

#### **4-2-3. Hosting of international research meetings**

iCeMS will host international research meetings both in Japan and abroad, not only as presentation venues for young researchers talented enough to become PIs in the future, but also as places where researchers from different disciplines gather and exchange to acquire new insight, to boost motivation of individual researchers and encourage networking. International research meetings outside Japan will be co-hosted by local research institutes, as a potential opportunity for the establishment of a new satellite laboratory.

#### **4-2-4. Joint retreats by iCeMS and partner institutes**

Annual domestic retreats have been held since 2009 for generation of new collaborations and acceleration of ongoing multidisciplinary projects. From now on, iCeMS will host joint retreats with its overseas partner institutes, for such purposes as conducting joint research and founding a satellite laboratory, and also with the hope that they will provide iCeMS with a chance to find talented postdocs or researchers for possible employment.

#### **4-2-5. iCeMS Caravan**

iCeMS has hosted delivery-style workshops by its young researchers, targeting senior high-school students in Japan. The target is going to be expanded to cover overseas postgraduate and undergraduate students as well, so that local workshops abroad will help such students take interest in research pursued by iCeMS and will eventually stimulate them to consider joining iCeMS as postdocs.

#### **4-2-6. iCeMS Seminar Tours by young researchers**

Young researchers will conduct seminar tours on their employment or promotion. They will visit three overseas institutes to undergo evaluation of local researchers from a global perspective, while also building their network of contacts as their personal assets. The tours will also help iCeMS create its own international research networks and will contribute to its circulation of best brains.

#### **4-2-7. Allocation of specialists to deal with international circulation of best brains**

To plan and support activities associated with the international circulation of best brains mentioned above, iCeMS will deploy international affairs specialists with planning ability and foreign language proficiency.

## **5. Support by Host institution**

\* Describe measures that the host institution will take to support and sustain your WPI center. Describe your strategy for extending the system reforms achieved by the center via the WPI program to the host institution and other institutions.

### **5-1. Support Policy of Host Institution to Sustain the Center**

To secure resources for operations and research activities of iCeMS, Kyoto University will implement the following measures:

1. As a necessary financial measure for the iCeMS' operation, the university will provide indirect costs associated with competitive grants to iCeMS.
2. The university will provide positions and expenses for principal investigators (PIs).
3. The university will provide full-time positions and expenses to support the administrative part.
4. The university will provide postdocs (tenure-track researchers) and overseas researchers with tenure positions.
5. Aiming to maintain a world-class institute, the university will offer a research environment of the highest quality, with fully-equipped facilities for exclusive use.
6. The university will support maintenance cost for large-scale facilities and equipment.

### **5-2. Strategy for extending the system reforms achieved by the center via the WPI program to the host institution and other institutions**

The system reforms implemented by iCeMS, with its achievements and experience through the 10-year WPI program since 2007, has received a high evaluation at Kyoto University and made certain contribution to the university-wide reforms of various systems. iCeMS is expected to remain as a model for leading-edge approaches to be taken by the university in the future.

#### **1. WINDOW Concept: Kyoto University's vision for the future**

In August 2015, President Yamagiwa formulated "WINDOW Concept" as the future vision of Kyoto University. The word "WINDOW" stands for: **W**ild and **W**ise; **I**nternational and **I**nnovative; **N**ature and **N**oble; **D**iverse and **D**ynamic; **O**riginal and **O**ptimistic; and **W**omen, Leaders in the **W**orkplace. In its Strategic Priority 2-2 for being "International and Innovative," Kyoto University set a goal of founding a World Premier International Research Center (WPI Research Center) as a hub of front-line research, and actually established the Kyoto University Institute for Advanced Study (KUIAS) in April 2016. KUIAS was founded in order to optimize the experience and knowledge obtained by iCeMS and seek university-wide practice of its excellent approaches. iCeMS joined KUIAS in April 2017 as an its research institutes, assuming major roles to further advance its cutting-edge research, cultivate the next generation of research professionals, and accelerate the circulation of outstanding research talent both within Japan and overseas.

#### **2. Personnel management**

In response to its increased need, a new salary system including cross-appointment scheme and annual salary system has been introduced into the personnel management of whole Kyoto University. Abolishment of the retirement age has also been implemented in the Center for iPS Cell Research and Application, the Graduate School of Advanced Integrated Studies in Human Survivability, the Institute for Liberal Arts and Sciences, and KUIAS; further increase of its target institutes is expected in the future, along with a rise in the maximum salary for such positions as specialist staff members.

#### **3. Overseas researchers support**

The Overseas Researchers Support Office, established in 2009, has assisted foreign researchers in quickly and smoothly adapting not only to their new research environment but

also to their new lives in Japan. They specifically provide assistance with immigration procedures, resident status updates, housing arrangements and other matters related to daily life. Their accumulated know-how now allows them to support departments outside iCeMS as well. Continued expansion of this assistance system will be pursued, targeting various other departments of Kyoto University.

#### **4. University-level administrative reforms**

In July 2013, Kyoto University undertook substantial administrative reforms such as relocation and centralization of staff members, new positions for supporting education and research, implementation of rigorous evaluation and training systems to increase administration efficiency, and consolidation of back-office organizations into common administrative departments. iCeMS has come to support and accelerate internationalization beyond its own framework, for such institutes as the Graduate School of Advanced Integrated Studies in Human Survivability, as well as the Institute for Liberal Arts and Sciences established in 2013. At the Institute for Liberal Arts and Sciences, more than one hundred overseas faculty members are employed as tenured staff to teach classes in English.

iCeMS' rich accumulation of experience in internationalization is anticipated to have a large impact on such new institutions as mentioned above. For example, former staff members of iCeMS often remain active in international services even after being transferred to other departments, utilizing their expertise and experience gained while working for iCeMS.

#### **6. Financial Measures**

\* In Appendix 4, describe the measures to be taken by the host institution for sustaining the center's functions and activities over a period of 5 years, and describe what external funding will be used to carry out the center's research activities.

## World Premier International Research Center Initiative (WPI) List of Principal Investigators

- If the number of principal investigators exceeds 10, add columns as appropriate.
- Place an asterisk (\*) by the name of the investigators who are considered to be ranked among the world's top researchers.
- Give age as of 1 April 2017
- For investigators who cannot participate in the center project when its application, indicate the time that their participation will start in the "Notes" column.

Name	Age	Current affiliation (organization, department)	Academic degree and current specialties	(Notes) Enter "new" or "ongoing"
1. Kitagawa, Susumu*	65	Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Coordination Chemistry	Ongoing
2. Kageyama, Ryoichiro*	60	Professor, Institute for Frontier Life and Medical Sciences, Kyoto University	M.D. Ph.D. Developmental Biology	Ongoing
3. Uesugi, Motonari*	50	Professor, Institute for Chemical Research, Kyoto University	Ph.D. Chemical Biology	Ongoing
4. Kengaku, Mineko*	50	Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Developmental Neurobiology	Ongoing
5. Sivaniah, Easan*	45	Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Physics	Ongoing
6. Wang, Dan Ohtan	41	Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Neuroscience, Chemical biology	Ongoing
7. Packwood, Daniel	31	Junior Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Applied Mathematics, Theoretical Chemistry	Ongoing
8. Ueda, Kazumitsu*	63	Professor, Graduate School of Agriculture, Kyoto University	Ph.D. Cellular Bio-chemistry	Ongoing
9. Sugiyama, Hiroshi*	60	Professor, Graduate School of Science, Kyoto University	Ph.D. Chemical Biology	Ongoing

Name	Age	Current affiliation (organization, department)	Academic degree and current specialties	(Notes) Enter "new" or "ongoing"
10. Imahori, Hiroshi*	55	Professor, Graduate School of Engineering, Kyoto University	Ph.D. Organic Chemistry	Ongoing
11. Tanaka, Koichiro*	54	Professor, Graduate School of Science, Kyoto University	Ph.D. Terahertz Optical Science	Ongoing
12. Saitou, Mitinori*	46	Professor, Graduate School of Medicine, Kyoto University	M.D. Ph.D. Germ Cell Biology	Ongoing
13. Carlton, Peter	43	Associate Professor, Graduate School of Biostudies, Kyoto University	Ph. D. Molecular and Cell Biology	Ongoing
14. Tamanoi, Fuyuhiko*	69	Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Nanoparticles and Cancer Therapy	New
15. Suzuki, Jun*	39	Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Medical Biochemistry, Cell Membrane Biology	New
16. Kamei, Ken-ichiro	41	Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Nano materials, Nano bioscience	New
17. Furukawa, Shuhei*	39	Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Coordination Chemistry	New
18. Horike, Satoshi*	39	Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Materials Chemistry	New
19. Hirori, Hideki	39	Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Terahertz Optical Science	New

Name	Age	Current affiliation (organization, department)	Academic degree and current specialties	(Notes) Enter "new" or "ongoing"
20. Sugimura, Kaoru	38	Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Biophysics, Developmental biology	New
21. Hasegawa, Kouichi	44	Junior Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Cell biology, Developmental biology	New
22. Nishida, Eisuke*	63	Professor, Graduate School of Biostudies, Kyoto University	Ph. D. Cell Biology	New
23. Matsuda, Michiyuki*	58	Professor, Graduate School of Biostudies, Kyoto University	Ph. D. Experimental pathology, Cell biology	New
24. Mori, Yasuo*	57	Professor, Graduate School of Engineering, Kyoto University	Ph. D. Molecular Biology	New
25. Hamachi, Itaru*	56	Professor, Graduate School of Engineering, Kyoto University	Ph. D. Synthetic chemistry	New
26. Kitagawa, Hiroshi*	55	Professor, Graduate School of Science, Kyoto University	Ph. D. Solid state chemistry	New
27. Kageyama, Hiroshi*	47	Professor, Graduate School of Engineering, Kyoto University	Ph. D. Solid state chemistry	New
28. Abe, Ryu*	43	Professor, Graduate School of Engineering, Kyoto University	Ph. D. Catalyst science	New

**World Premier International Research Center Initiative (WPI)**  
**The number of Center personnel**

	FY2017
Principal Investigators	28
Other Researchers	9
Post-Doctor researchers	32
Research Support Staffs	45
Administrative Staffs	15

## World Premier International Research Center Initiative (WPI) Diagram of management system

