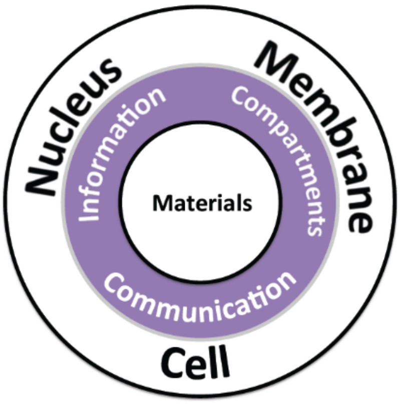
World Premier International Research Center Initiative (WPI)
Activities Report of the WPI Academy Center
(FY 2017 – FY 2019)

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

Common Instructions:
* Unless otherwise specified, prepare this report based on the current (31 March 2020) situation of your Center.
* Use yen (\) when writing monetary amounts in the report. If an exchange rate is used to calculate the yen amount, give the rate.
* Prepare this report within 10 pages (excluding the appendices, and including "Summary of State of WPI Academy Center Progress" (within 2 pages)).

Summary of WPI Academy Center's Activities (write within **2 pages**)

WPI-iCeMS seeks to establish unique science at the interface of cell biology and materials science. Working at this interface is challenging because these fields are fundamentally different. Cell biology studies highly complex systems that have evolved over thousands of years. On the other hand, materials science studies systems that evolve in complexity by leaps in human progress. By integrating such diverse scientific approaches, the iCeMS leadership of Kitagawa, a world class leader in materials science, seeks to facilitate dialogue among iCeMS researchers in order to achieve an ambitious goal: the 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), WPI Academy-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.



True integration of cell and materials sciences should be bidirectional, making ground-breaking contributions to both cell biology and materials sciences. iCeMS is achieving 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**

Development of new materials and technologies to monitor and control cell state and function.

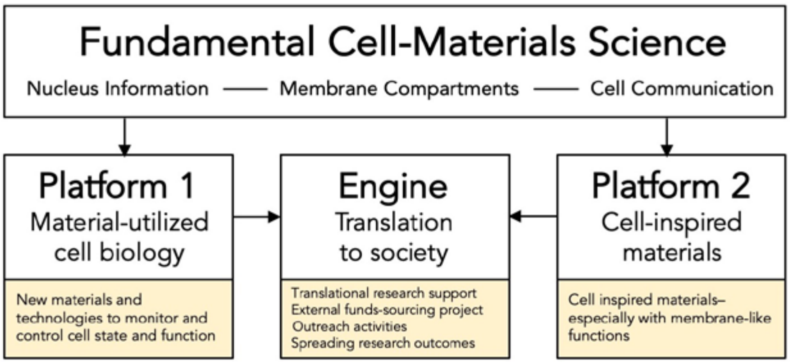
- **Platform 2. Breathing, cleansing and transformation through cell-inspired materials**

Generation of smart materials with functionalities equivalent to those of membrane compartments in living cells, which simultaneously "select" and "condense" molecules, and their application in the fields of medicine, energy and environment.

- **Translation Engine. A crucible for creativity**

Enhancement of its public relations effort to convey its research results, achieved through the two platforms mentioned above, to a broader part of society in a more comprehensible manner.

System for Managing the Research Organization in a "world premier" status



To maintain research standards and operation of the Center at a "world premier" status, young ambitious researchers Suzuki, Horike, Fujita Fukazawa and Sugimoto in addition to Tamanoi and Nakanishi have been employed as PIs from outside iCeMS, while young talented researchers, Furukawa, Kamei, Sugimura, Hasegawa and Namasivayam, have been newly appointed to PIs from inside iCeMS. As a result, among 10 core PIs 30% are international researchers and 20% are female researchers. Their average age is 42.1. To achieve true integration of "cell biology" and "materials science", flexible thinking and spirit of challenge are required. The environment of iCeMS, that values diversity of scientific field, nationality, gender, and age has been producing fruitful research results, which includes "Structural colour using organized microfibrillation in glassy polymer films" ***Nature*** **(Ito)**, "Design and control of gas diffusion process in a nanoporous soft crystal "***Science*** **(Gu)**, "Enhanced selectivity in mixed matrix membranes for CO_2 capture through efficient dispersion of amine-functionalized MOF nanoparticles" ***Nature Energy*** **(Ghalei)**, "Coupling delay controls synchronized oscillation in the segmentation clock" ***Nature*** **(Yoshioka-Kobayashi)**, "Metal-Organic-Framework-Based Biomedical Microrobots" ***Advanced Materials*** **(Wang)**.

For further facilitation of interdisciplinary research activities and international circulation of best brains, iCeMS established five collaborative laboratories with overseas research institutes, (1) "Smart Materials Research Center" with Thai-VISTEC (out-bound type), (2) "Center for Integrated Biosystems" with Taiwan Academia Sinica (out-bound type), (3) "Kyoto University Shanghai Lab" with Fudan University in China (out-bound type), (4) "Quantum Nano Medicine Research Center" with UCLA in the US (currently in-bound but developing to cross-bound type) and (5) "Small Molecule Laboratory (Smolab)" with CNRS-LIA in France. "**Smart Materials Research Center**" and "**Small Molecule Laboratory (Smolab)**" are aiming to synthesize new materials inspired by biological reactions to solve environmental and energy problems. "**Center for Integrated Biosystems**" and "**Kyoto University Shanghai Lab**" are aiming to identify new molecules which regulate and control important physiological reactions. "**Quantum Nano Medicine Research Center**" is creating a new field by the convergence of quantum beams research and nanomaterial studies to cure cancer and infectious diseases.

In addition to the research platforms, we bring WPI-iCeMS to a higher level of visibility by setting up the "**Translation Engine**" that functions as an interface to society. Such efforts are performed under the leadership of the Public Engagement Unit of iCeMS, with researchers encouraged to present their work in ways accessible to those outside of their field, and beyond the general scientific audience using modern media tools. A striking example of this is the iCeMS Learning Lounge series, which is available for the world to see on YouTube. In the iCeMS Caravan, young researchers visit far-flung schools to deliver a fun experience of thinking like an interdisciplinary scientist for a day. iCeMS launched its Instagram account in Nov 2018 adding to its already-active Facebook and Twitter, and increased visually attractive web postings with illustrations photos, and videos to capture the interest of social media users. This kind of visibility in turn will enhance the institute's sustainability to develop further impactful fundamental breakthroughs in cell-material sciences and contribute to the overall development of the WPI Program.

* Describe clearly and concisely the progress being made by the Center from the viewpoints below.
- In addressing the below-listed 1-8 viewpoints, place emphasis on the following:
(1) Whether research standards and operation of the Center is maintaining a "world premier" status.
(2) Whether the Center participate and cooperate to the activities to advance the overall development of the WPI Program and to promulgate its achievements.

1. Overall Image of Your Center

・Describe the Center's current identity and overall image.
・List the Principal Investigators in Appendix 2, diagram the Center's management system in Appendix 3-1, enter the number of center personnel in Appendix 3-1a, and enter center funding in Appendix 3-2.

WPI-iCeMS established a unique place in science, at the interface of fundamental cell biology and materials science. A fundamental approach was taken to the way that cell biology and materials can be combined to become relevant to global issues such as disease or diet, energy or the environment. iCeMS concentrates on the study of three essential properties of cells and cell biology: **Cell Communication**; **Nucleus Information**; and **Membrane Compartments**. **Generation of Smart Materials** with functionalities equivalent to those of membrane compartments in living cells, which simultaneously "select" and "condense" molecules, and their application in the fields of medicine, energy and environment. Now being a research institute of the Kyoto University Institute for Advanced Study (KUIAS), WPI Academy-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. Advancing Research of the Highest Global Level

・Describe what's been accomplished in the Center's research objectives and plans.
・In Appendix 1, list the papers underscoring those research achievement and list the Center's research papers published in 2017-2019 in a manner prescribed in Appendix A.

True integration of cell and materials sciences should be bidirectional, making ground-breaking contributions to both cell biology and materials sciences. iCeMS is achieving such true integration through two platform concepts of "Utilization of cells" and "Inspiration to materials".

- **Platform 1. Synthetic paradigms for cell programming and its utilization**

Major efforts in the fields of cell biology have been made toward understanding the molecular signals regulating cell differentiation and function and those orchestrating the cell-cell interactions in tissues. iCeMS, having pioneered such research at its most fundamental level, will continue it by developing new materials and technologies to monitor and control cell state and function. We here describe key research achievements of platform 1.

The **Kageyama** group published a manuscript entitled "Coupling delay controls synchronized oscillation in the segmentation clock" (***Nature***, 580, 119, 2020).

Somatic stem cells actively proliferate and give rise to different types of mature cells (active state) in embryonic tissues while they are mostly dormant (quiescent state) in adult tissues. Here, they found that the expression dynamics of Hes1 is a key regulatory mechanism of generating and maintaining active/quiescent stem cell states.

The **Wang** group published a manuscript entitled "Synaptic N^6-methyladenosine (m^6A) epitranscriptome reveals functional partitioning of localized transcripts" (***Nature Neuroscience***, 21, 1004, 2018).

A low-input genome-wide N^6-methyl-adenosine (m^6A)-sequencing protocol was established to determine a chemically modified local transcriptome in healthy adult mouse forebrains as the synaptic m^6A epitranscriptome. Their findings indicate that very simple chemistry on RNA molecules such as adding -CH_3 moiety can have far reach impact on brain development and cognitive function.

The **Hasegawa** group published a manuscript entitled "Chemically defined and growth-factor-free culture system for the expansion and derivation of human pluripotent stem cells" (***Nature Biomedical Engineering***, 2, 173-182, 2018).

This paper reports NR5A1 gene and protein function in chemically-induced naive state of human pluripotent stem cells. In order to identify the function, they have applied several chemicals in combination of epigenetic analysis and transcriptome analysis. This study is matched to iCeMS concept "Comprehension and utilization of cells" of the integration of cell science and materials science.

The **Sugimura** group published a manuscript entitled "AIP1 and cofilin ensure a resistance to tissue tension and promote directional cell rearrangement" (***Nature Communications***, 9, 3295, 2018).

The global patterns of forces in a tissue control many aspects of development including cell proliferation, cell rearrangement, and cell polarity. They found that anisotropic tissue tension localizes AIP1, a cofactor of cofilin, on the remodeling junction via cooperative binding of cofilin to F-actin. AIP1 and cofilin promote actin turnover and locally regulate the Afadin-mediated linkage between actomyosin and the junction. This mechanism is essential for cells to resist the mechanical load imposed on the remodeling junction perpendicular to the direction of tissue stretching. Thus, the present study delineates how AIP1 and cofilin achieve an optimal balance between resistance to tissue tension and morphogenesis.

- **Platform 2. Breathing, cleansing and transformation through cell-inspired materials**

Here we take on the cellular function of membrane compartments. Membrane compartments in living cells simultaneously "select" and "condense" molecules. Learning from sequential, integrated functions of cells in capturing, separating, transporting, storing, and transforming molecules. We will use this general cell-inspired theme to generate smart materials to achieve the equivalent of these membrane functionalities for application in healthcare, energy and the environment. We describe key research achievements of platform 2.

The **Kitagawa** group published manuscripts entitled "Highly responsive nature of porous coordination polymer surfaces imaged by in situ atomic force microscopy" (***Nature Chemistry***, 11, 109, 2018), and "Design and control of gas diffusion process in a nanoporous soft crystal" (***Science***, 363, 387, 2019).

Cell membranes form a boundary with a dynamic structure. Design of surface dynamic structure in porous materials is expected to create new functions. The highly guest-responsive nature of the surface of single-crystalline porous coordination polymers (PCPs) is directly observed by in situ liquid-phase high-speed atomic force microscopy. A sharp and reversible response of the surface domain to the presence or absence of guest molecules was observed under conditions that can scarcely induce the transformation of the bulk crystal.

Dynamic channel structures are essential for the recognition of molecules and ions. They presented the rational design of a diffusion-regulatory system in PCPs in which the channel traffic of guest molecules is regulated by the flexible and dynamic motions of nanochannels with flip-flop molecular motions in the pore surface.

The **Sivaniah** group published manuscripts entitled "Structural colour using organized microfibrillation in glassy polymer films" (***Nature***, 570, 363, 2019), and "Enhanced selectivity in mixed matrix membranes for CO_2 capture through efficient dispersion of amine-functionalized MOF nanoparticles" (***Nature Energy***, 2, 17086, 2017).

This study represents an understanding of a fundamental process - microfracture in polymer systems, and through this understanding, one is able to replicate the biomimetic coloration observed in many contemporary flora and fauna. They demonstrated an ability to print at the highest resolutions, in color, without the need for chemical pigments. The second paper describes the generation of advanced membrane technology for separation and future sequestration of climate-change gases. The work is a result of a strategic integration between MOF/PCP technology and the polymer membrane technology.

The **Furukawa** group published a manuscript entitled "MOFBOTS: Metal-Organic-Framework-Based Biomedical Microrobots" (***Advanced Materials***, 31, e1901592, 2019).

In this study, magnetic helical microstructures coated with a kind of zinc-based MOF, zeolitic imidazole framework-8 (ZIF-8), with biocompatibility characteristics and pH-responsive features, are successfully fabricated. This highly integrated multifunctional device can swim along predesigned tracks under the control of weak rotational magnetic fields. This new approach toward the fabrication of integrated multifunctional systems will open new avenues in soft microrobotics beyond current applications. This project is a truly multidisciplinary international collaborations between iCeMS, ETH Switzerland and TU Graz Austria.

The **Packwood** group published a manuscript entitled "Materials informatics for self-assembly of functionalized organic precursors on metal surfaces" (***Nature Communications***, 9, 2469, 2018).

The controlled self-assembly of molecules into desired structures is a major goal of materials science. In this paper, they develop an unsupervised machine learning method to determine how the chemical properties of organic molecules determine how they self-assemble on surfaces. From these results, they deduced some 'rules' for choosing molecules which assemble into desired structures. By using their method, they could determine ways to create such bio-active molecular self-assemblies outside of the cell.

3. Facilitating Interdisciplinary Research Activities

・Describe the content of measures taken by the Center to facilitate interdisciplinary research activities. For example, measures that create an environment that will facilitate doing joint research by researchers in differing fields.
・Describe the contents and results of interdisciplinary research activities yielded by the measures described above.

iCeMS is aiming to establish a unique place in science, at the interface of fundamental cell biology and materials science. To drive this difficult task, we first set our ambitious goal as creation of “**Materials for Cell Elucidation and Control**”. Then, iCeMS has concentrated on the study of three essential properties of cells and cell biology: **Cell Communication**; **Nucleus Information**; and **Membrane Compartments**. True integration of cell and materials sciences should be bidirectional, making ground-breaking contributions to both cell biology and materials sciences. iCeMS is achieving 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**”.

iCeMS has facilitated interdisciplinary research activities through focused funding schemes, monthly gatherings, annual retreats and even simply through the action of proximal working spaces. Every month many researchers including PIs and young researchers join to present research updates and to explore new areas for collaboration. Indeed we have been rewarded by an enhanced degree of materials-biology collaborations over the past 13 years. Moreover, the researchers are encouraged to present their work in ways that are accessible to those outside of the field, through the iCeMS Learning Lounge series.

4. Maintaining an International Research Environment

・Describe what’s been accomplished in the efforts to raise the Center’s recognition as a genuine globally visible research institute, along with innovative efforts proactively being taken, including the following points, for example:
- Efforts being developed to maintain an international research environment based on the analysis of number and state of world-leading, frontline researchers; exchanges with overseas entities
- Proactive efforts to raise the level of the Center’s international recognition
- Efforts to make the Center into one that attracts excellent researchers from around the world (such as creating of an environment in which researchers can concentrate on their research, providing startup research funding, supporting efforts that will foster young researchers and contribute to advancing their career paths, and arranging support system for the research activities of overseas researchers.)
- Consolidation of the administrative structures to support implementing the efforts described above

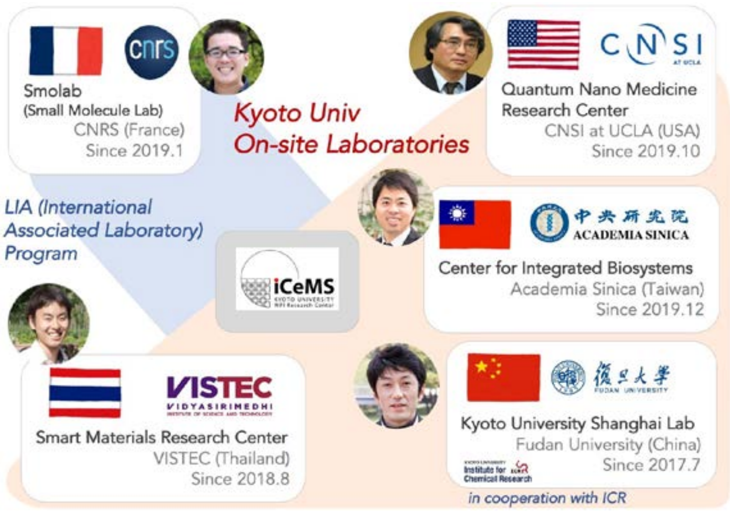
・In Appendix 3-1, describe the state of cooperation with overseas satellites, and list the main international research meetings held by the Center.

4-1. Promotion of International Brain Circulation

Through the international symposia and joint research projects with overseas institutes, iCeMS encourages active exchanges among researchers to enhance international network and strengthens the global competitiveness of young researchers.

4-2. Establishment of Collaborative Laboratories including Satellites

iCeMS established five collaborative laboratories with overseas research institutes, (1) “Smart Materials Research Center” with Vidyasirimedhi Institute of Science and Technology (VISTEC) in Thailand (out-bound type), (2) “Center for Integrated Biosystems” with Taiwan Academia Sinica (out-bound type), (3) “Kyoto University Shanghai Lab” with Fudan



On-site Laboratories

University in China (out-bound type), (4) "Quantum Nano Medicine Research Center" with UCLA in the US (currently in-bound but developing to cross-bound type) and (5) "Small Molecule Laboratory (Smolab)" as International Associated Laboratory (LIA) with French National Centre for Scientific Research (CNRS) .

Smart Materials Research Center

4-3. iCeMS Internationalization Program

iCeMS has offered a grant program for research abroad and invitation of overseas researchers to enhance the international research networks and to improve the international recognition of the WPI program. During three years from FY2017 to FY2019, 15 overseas researchers from North America (4), Europe (3) and Asia (8) were invited by iCeMS, and a total of 5 iCeMS researchers were dispatched to overseas institutes in North America (1), Europe (3), and Asia (1). The program allowed their round trips and stays of 1-6 weeks.

4-4. International Symposia Held for Brain Circulation

iCeMS hosted 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 insights, to boost the motivation for research and encourage networking. The international research meetings outside Japan were co-hosted by local research institutes, and many of them led to the establishment of new satellite laboratories, such as the ones in Thailand, Taiwan, and France.

4-5. iCeMS Retreats with Inviting Overseas Prominent Researchers

iCeMS held its annual retreats for the purpose of sharing the on-going, unpublished multidisciplinary research activities, and invited several overseas prominent researchers. In 2017 and 2018, the invited researchers from overseas institutes from the United States, Taiwan, Thailand, and China made excellent scientific lectures. In 2019, iCeMS invited overseas researchers, who have a different connection with the iCeMS PI, from the United States, Israel, and South Korea. Many of these connections have evolved into further research collaborations.

4-6. Academic Exchange and Cooperation Agreements

iCeMS actively engages in international exchanges and has signed 10 agreements including a university-level agreement since the beginning of the WPI Academy project, so that there are a total of 17 effective cooperation agreements. Three On-site Laboratories have been established on the basis of the agreements with UCLA (the United States), VISTEC (Thailand), and Academia Sinica (Taiwan). Furthermore, King Abdullah University of Science and Technology (KAUST) in Saudi Arabia will provide a research subaward to iCeMS from 2020, triggered by their cooperation agreement signed in 2019.

5. Making Organizational Reforms and their Ripple Effects

- Describe distinctive effort in managing research operation and administrative organization, such as the strong leadership that the director is giving on the Center's operation, strong performance by the administrative director who provides the center director with strong administrative and managerial support, and division of roles and authority between the Center and its host institution.
- Describe the ripple effects that activities to disseminate experience and know-how accumulated by the Center, such as the followings, have/had on the host institution (or other research institutes, if any):
  - System reforms made through the Center's leading activities to its research operation and administrative organization
  - Experience and know-how accumulated by the Center as it have worked to establish itself as top world-level research institutes.
- Other than the above, give examples, if any, of cooperative activities by the Center and the whole WPI Program or other WPI centers, to disseminate experience and know-how accumulated by the WPI program and/or the WPI centers.

5-1. WINDOW Concept: Kyoto University's Vision for the Future

In August 2015, President Yamagiwa formulated "WINDOW Concept" as the future vision of Kyoto University (http://www.kyoto-u.ac.jp/window/en/). The word "WINDOW" stands for: Wild and Wise; International and Innovative; Nature and Noble; Diverse and Dynamic; Original and Optimistic; and Women, Leaders in the Workplace. In its Strategic Priority for being "International and Innovative," Kyoto

University set a goal of founding a WPI research center as a hub of front-line research, and actually established 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, 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. In 2018, a new WPI research center, Institute for the Advanced Study of Human Biology (ASHBi) was established in KUIAS. The Directors and the Research Administrative Directors at both iCeMS and ASHBi continually exchange information on important policies such as organization, research resources, outreach, and so on.

5-2. Establishment of the Research Administration Office (RAO)

iCeMS newly established its "Research Administration Office (RAO)" within the organization in 2017. The RAO has contributed as “Translation Engine” to conveying the research results to a broader part of society in a more comprehensible manner. So far, successful projects achieved by the RAO have been disseminated to the host institution, Kyoto University and other WPI centers.

The purpose of the RAO is (1) improvement of research activity, (2) enhancement of global cooperation, public relations, and outreach, and (3) reinforcement of research infrastructure. To realize them, it consists of Research Administrative Director, Innovation Unit, Public Engagement Unit, and Analysis Center. Innovation Unit and Public Engagement Unit include four Program-specific faculty members, who have various specialized skills such as public relations, scientific illustration, intellectual properties, and legal affairs, and have planned and improved international brain circulation, outreach activities, and resource influx, etc. To strengthen the research base of iCeMS, the Innovation Unit plans, performs, and provides support for diverse measures to promote financial support (external funding, donation, and other resources) and human exchange (academic exchange, industry-academia collaboration, technology transfer, etc.). The Public Engagement Unit focuses on outreach activities as well as domestic and international public relations to share iCeMS research outcomes. With these activities, this Unit aims to eventually promote international brain circulation. The Analysis Center includes its Director and three Program-specific faculty members, and consists of the Materials Analysis Unit, with atomic/molecular characterization equipment, and the Bioanalysis Unit, which has facilities for the observation and analysis of biological molecules and cells.

5-3. Cooperation with Kyoto University Headquarters

The RAO has also associated with other sections belonging to the central administration in the host institution, such as the Kyoto University Research Administration Office (KURA), Office of Society Academia Collaboration for Innovation (SACI), and so forth. The KURA facilitates the development of an environment where researchers are dedicated to their research work with a focus on planning and operating research projects and returning the benefits of research to society. The iCeMS RAO has associated with KURA to support grant application by iCeMS researchers and to share the experience and knowledge gained through the establishment of the iCeMS On-site Laboratories with other departments in Kyoto University. RAO also makes smooth cooperation with KUIAS administration office (General Affairs, Financial Planning, Research Promotion, and Overseas Affairs and Planning/Public Relations), and central administration of Kyoto University, such as the Public Relation Division, the International Affairs Division, and so forth.

5-4. Cooperation with WPI-ASHBi

In October 2018, Kyoto University established another WPI center, ASHBi, as one of the research centers of KUIAS. The two WPI centers are closely located and have cooperated in organizing important institutional events. For example, on 16 Dec

ASHBi Retreat 2020 held in cooperation with iCeMS

2019, iCeMS and ASHBi received a delegation of professor/PI level researchers from the National Cheng Kung University College of Medicine (NCKU) in Taiwan to hold a joint meeting consisting of 8 NCKU, 5 iCeMS, and 3 ASHBi researchers. In addition, the two Deputy Directors of iCeMS (Suzuki and Kengaku) was invited at the first ASHBi Retreat, which was held on Awaji island 7-8 Feb 2020, and introduced iCeMS' research activities and core facilities to ASHBi members. Such cooperation is expected to enhance collaboration between the two institutions.

5-5. Cooperation with other WPI Centers

In January 2020, iCeMS and Kanazawa University Nano Life Science Institute (NanoLSI) held the joint symposium, the "1st WPI NanoLSI-iCeMS Joint Symposium on Nanoimaging and Advanced Materials for Life Science". This symposium facilitated their future research collaboration.

6. Effort to Enhance and Amplify the Visibility and Brand of the Overall WPI Program

・Describe how the Center's outreach activities have contributed to enhancing and amplifying the visibility and brand of the WPI program. Describe the successful cases of the Center's outreach activities in Appendix 4, and enter the number of activities in Appendix 4a.
・Other than the above, describe, if any, the activities and their concrete contents that have contributed to the enhancement and amplification of the visibility and brand of the WPI program (such as holding a large international research meeting, collaborative activities with multiple WPI centers). If you have already provided this information, please indicate where in the report.

6-1. Publication of Brochures and Newsletters

iCeMS published its brochures with the general information of the institute, and the newsletters "Our World Your Future" vol. 5-9 (two or three times a year) to reach high school students and other the general public, all in both English and Japanese.

6-2. Dissemination of Activities on WPI Academy

iCeMS ran its exhibition booths at the WPI Science Symposia (2017-2019) and joint booths with other WPI institutes at AAAS Annual Meeting 2018 and 2019. It also presented a joint booth at the European Materials Research Society (E-MRS) conferences (2017-2019 spring meetings) to introduce the research environment in Japan and WPI to materials scientists from all over the world.

iCeMS planned a series of lectures for general public together with IFReC, and has delivered the first lectures in the center of Osaka. More lectures are planned to be held via webinar this summer.

iCeMS has a number of innovative research support systems, in the international PR, in the support of overseas researchers, in sharing the most advanced analysis equipment, and in many other ways. These efforts have been made public at various occasions such as the WPI Forum website and the Research University Consortium symposium, and that has been helped the dissemination of WPI's unique initiative to other academic institutions throughout Japan.

6-3. Learning Lounge

iCeMS provided opportunities for young scientists to present importance of their own research toward audience without a scientific background. Four young researchers and four guests gave a talk.

6-4. Enlightenment of Science to High School Students

iCeMS in particular focuses on scientific enlightenment activities for high school students. The workshop series "iCeMS Caravan", where iCeMS' young researchers visit high schools all over Japan and the students experience the thought process of scientists, has been held 8 times since FY2017, the iCeMS Science Festival was held 3 times, and an exhibition booth has been presented at the Super Science High School Festival every summer jointly with other WPI institutes.

iCeMS caravan usually targets senior high school students in Japan. The target has been expanded to cover overseas senior high school students, such as Northeast Yucai School in Shenyang, China.

6-5. International and Domestic Publication of Research Results

iCeMS actively publishes research results, both domestically and internationally. More than ten press releases are published in both Japanese and English every year. A unique feature of the iCeMS press releases is that each press release is distributed along with an artistic and approachable illustration to represent the news. The use of illustrations has clearly increased the visibility of iCeMS press releases on science news portals such as Asia Research News and EurekAlert!, which has obviously accelerated the dissemination of the research findings. The number of views and shares of iCeMS social media posts have also improved since it started using illustrations.

7. Effort to Secure the Center's Future Development over the Mid- to Long-term

・Address each of the following items that have been done to secure mid- to long-term center development:
- Contents of the measures taken by the host institution to support maintaining the activities of the Center (such as securing financial and personnel resources, coordination among host institution to bring together in-house researchers, in-kind provision and/or facilities afforded in terms of usage of building, lab space and other equipment, new management reform carried out after the funding period ends).
- Actions and measures taken to sustain the Center as a world premier international research center.

7-1. Key Role in Realizing the Designated National University Vision

Kyoto University has set "Designated National University Vision" in 2017 (https://www.kyoto-u.ac.jp/en/about/operation/designated/designated.html). One of the cores in the Vision is "A flexible and dynamic approach to knowledge creation". iCeMS has contributed to promoting world-leading, cutting-edge research via fusing sciences (chemistry and biology) and activity of KUIAS. iCeMS has also contributed to establishment of multiple international On-site Laboratories.

7-2. Support Policy of Host Institution to Sustain the Center

To secure resources for operations and research activities of iCeMS, Kyoto University has implemented the following measures for the recent three fiscal years:

1. As a necessary financial measure for the iCeMS' operation, the university has provided indirect costs associated with competitive grants to iCeMS.
2. The university has provided 10 positions and expenses for principal investigators (PIs).
3. The university has provided 2 overseas researchers with tenure positions.
4. The university has provided 8 young researchers.
5. The university has provided 9 full-time positions and expenses to support the administrative part.
6. The university has offered a research environment of the highest quality, with a total area of about 11,000 square meters and fully-equipped facilities for exclusive use.
7. The university has supported maintenance cost for large-scale facilities and equipment.

7-3. 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. The cross-appointment scheme, which started with Tamanoi of UCLA employed as a PI in 2017, continues to be used for hiring excellent researchers of overseas universities to facilitate joint research and internationalization of research environment. Furthermore, Kyoto University has made cross appointments with Sugimoto of SPring-8 and Nakanishi of Nagoya University.

7-4. Overseas Researchers Support

The Overseas Researchers Support Office, established in iCeMS 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 have specifically provided assistance with immigration procedures, resident status updates, housing arrangements and other matters related to daily life. The Office was reorganized in KUIAS in 2016, and has supported not only iCeMS but also the new WPI research center, ASHBi, and several departments within the university, on the basis of the know-how the Office has accumulated.

7-5. University-level Administrative Reforms

In 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. Since then, the staff members with experience in various international operations at iCeMS has been transferred to another department within the university so as to utilize such experience. This staff circulation has helped raise the level of internationalization of the university as a whole.

7-6. Construction of iCeMS Alumni Database

iCeMS started to construct a database of alumni, who are currently, or were formerly, associated with iCeMS. The purpose of this database is to provide centralized management of iCeMS member information and to use this to send the iCeMS alumni attractive news regarding various events, donation opportunities, recruitment, and other relevant information. It is expected to enhance the interactive exchange of human resources and information among alumni.

8. Others

・Describe the Center's efforts over the past 3 years in making it a place that expands and accelerates the international circulation of the world's best brains. Give about 5 example of their success cases and describe their concrete contents and effect in narrative.
・In addition to the above1-7, note any of the Center's notable efforts and activities.

8-1. Spread of Research via the On-site Laboratory in Taiwan

In June 2019, iCeMS and Academia Sinica in Taiwan held a joint symposium, "Cellular and Molecular Sensing, Recognition and Response". At the end of the symposium, a total of about 30 researchers from both institutes had more than two hours of scientific free discussion on two themes, "aging and longevity" and "tumor and stem cells". Some collaborative researches have started via this opportunity. After the process, a new On-site Laboratory, the "Center for Integrated Biosystems", was established in Dec 2019, so that the basis for their collaboration was put in place. In addition, iCeMS have opened its Taiwan Office within the National Biotechnology Research Park in Taiwan, which functions as a hub to connect Kyoto University to research institutes and universities in Taiwan. The Office encourages their exchanges and collaborations, and will develop into an activity base throughout Kyoto University. In fact, another department in Kyoto University plans to make a joint research with the institutes in Taiwan.

8-2. Establishment of a New Cross-bound On-site Laboratory with UCLA

In 2017, iCeMS accepted Tamanoi in UCLA as a PI for iCeMS under a cross-appointment agreement. In Nov 2018, by bridging the both universities, he organized a joint international symposium, "Harnessing Physical Forces for Medical Applications – The Convergence of Physics, Nanomaterials, Cell Biology and Cancer Research". This process led to the establishment of a new-type cross-bound On-site Laboratory, "Quantum Nano Medicine Research Center", to promote the research and educational activities both in Japan and in the United States.

8-3. Young Researchers Internationalization Program (invite)

iCeMS invited Frederik Haase of Max-Planck-Institute for Solid State Research to Kyoto from 21 to 29 Oct in 2017. During the visit he participated in the iCeMS retreat to present a poster, and he also gave a talk in iCeMS' lecture series. Through the program he enjoyed exchanging views with iCeMS' researchers from a broad range of fields. He later joined iCeMS Furukawa Lab as a JSPS postdoc in June 2018 and engaged in research on porous materials until he left iCeMS in March 2020.

8-4. Young Researchers Internationalization Program (dispatch)

An assistant professor (later he becomes a junior associate professor and a PI) Ganesh Pandian Namasivayam visited India using this program from 29 July to 30 Aug 2018 and initiated collaborations with five labs in all different institutes/universities. During his visit, he performed bioinformatic analysis on an autistic animal model, as the representative of Kyoto University in the Indian government's program called Accelerating the Application of Stem Cell Technology in Human Disease. He also facilitated faculty/visiting faculty positions of two iCeMS researchers in IIT-Bombay, and appeared on Indian national television to talk about his research at iCeMS.

8-5. International Public Engagement

Thiago Negrão Chuba from Brazil is a Japanese-government-sponsored international student, studying at iCeMS as a master's student. He was largely encouraged to come to iCeMS by seeing the iCeMS website and social media since the site had important information and attractive contents all written in English, and lively English postings are frequently made on the iCeMS social media.

Appendix 1　List of Center's Major Research Achievements

1. List of Major Refereed Papers

*List **up to 20 papers** representative of the Center's research activities during the period between FY 2017 and FY 2019, and give brief descriptions (within 5 to 10 lines) of them.
*For each, write the author name(s); year of publication; journal name, volume, page(s), and article title. Any listing order may be used as long as format is the same. If a paper has many authors, underline those affiliated with the Center.
*If a paper has many authors (say, more than 10), all of their names do not need to be listed.

1. Gu, C; Hosono, N; Zheng, J-J; Sato, Y; Kusaka, S; Sakaki, S; Kitagawa, S; **2019**, ***Science***, 363, 387-391. Design and control of gas diffusion process in a nanoporous soft crystal.
   In the design of porous materials inspired by cell functions, a dynamic channel structure is essential for the recognition of molecules and ions. The channel traffic of guest molecules is regulated by the flexible and dynamic motions of nanochannels. Here, we present the rational design of a diffusion-regulatory system in a porous coordination polymer (PCP) in which the channel traffic of guest molecules is regulated by the flexible and dynamic motions of nanochannels with flip-flop molecular motions in the pore surface. This facilitates kinetics-based gas separations of oxygen/argon and ethylene/ethane with high selectivities of ~350 and ~75, respectively.

2. Hosono, N; Terashima, A; Kusaka, S; Matsuda, R.; Kitagawa, S; ***2018, Nature Chemistry,*** 11, 109-116. Highly responsive nature of porous coordination polymer surfaces imaged by in situ atomic force microscopy.
   Cell membranes form a boundary with a dynamic structure. Design of surface dynamic structure in porous materials is expected to create new functions. The highly guest-responsive nature of the surface of a single-crystalline porous coordination polymer (PCP) is directly observed by in situ liquid-phase high-speed atomic force microscopy. A sharp and reversible response of the surface domain to the presence or absence of guest molecules was observed under conditions that can scarcely induce the transformation of the bulk crystal.

3. Ito, MM; Gibbons, AH; Qin, DT; Yamamoto, D; Jiang, HD; Yamaguchi, D; Tanaka, K; Sivaniah, E; **2019**, ***Nature***, 570, 363. Structural colour using organized microfibrillation in glassy polymer films.
   This paper is officially recognized as a one of the technological break-through papers of 2019 by JST, and has received a lot of international and national coverage, including television. It represents an understanding of a fundamental process - microfracture in polymer systems, and through this understanding, one is able to replicate the biomimetic coloration observed in many contemporary flora and fauna. Through the work, we can demonstrate an ability to print at the highest resolutions, in color, without the need for chemical pigments.　Its implication is a shift away from the traditional means of printing and packaging, with high significance to reducing plastic waste.

4. Ghalei, B; Sakurai, K; Kinoshita, Y; Wakimoto, K; Isfahani, AP; Song, QL; Doitomi, K; Furukawa, S; Hirao, H; Kusuda, H; Kitagawa, S; Sivaniah, E; **2017**, ***Nature Energy***, 2, 17086. Enhanced selectivity in mixed matrix membranes for CO_2 capture through efficient dispersion of amine-functionalized MOF nanoparticles.
   This paper describes the generation of advanced membrane technology for separation and future sequestration of climate-change gases. It has received a Highly Cited Paper award from ISI, and represents a significant advance towards a low carbon future. The work is a result of a strategic integration between MOF/PCP technology and the polymer membrane technology. The work is a recognition of the benefits of alloys, and the combination of multiple chemistries to achieve advanced materials that have potential application not only in climate changes but also in the biomedical areas of portable or artificial lungs.

5. Yoshioka-Kobayashi, K; Matsumiya, M; Niino, Y; Isomura, A; Kori, H; Miyawaki, A; Kageyama, R; ***2020, Nature,*** 580, 119–123. Coupling delay controls synchronized oscillation in the segmentation clock.

Somatic stem cells actively proliferate and give rise to different types of mature cells (active state) in embryonic tissues while they are mostly dormant (quiescent state) in adult tissues. Here, we found that Hes1 expression is high in a quiescent state and oscillatory in an active state. When the Hes1 expression level is high, the proneural gene Ascl1 is continuously suppressed. By contrast, when Hes1 expression oscillates, it periodically represses Ascl1, thereby driving Ascl1 oscillations. High Hes1 and resultant Ascl1 suppression promote the quiescent state of neural stem cells, while Hes1 oscillation-dependent Ascl1 oscillations regulate their active state. Therefore, the expression dynamics of Hes1 is a key regulatory mechanism of generating and maintaining active/quiescent stem cell states.

6. Merkurjev, D; Hong, WT; Iida, K; Oomoto, I; Goldie, BJ; Yamaguti, H; Ohara, T; Kawaguchi, SY; Hirano, T; Martin, KC; Pellegrini, M; Wang, DO; ***2018, Nature Neuroscience,*** 21, 1004. Synaptic N-6-methyladenosine (m(6)A) epitranscriptome reveals functional partitioning of localized transcripts.
   A low-input genome-wide N6-methyl-adenosine (m6A)-sequencing protocol was established to determine a chemically modified local transcriptome in healthy adult mouse forebrains as the synaptic m6A epitranscriptome. This population of RNAs decorated with one or multiple methyl groups are functionally enriched in synthesis and modulation of tripartite synapses, and in pathways implicated in neurodevelopmental and neuropsychiatric diseases. Interrupting m6A-mediated regulation via knockdown of readers in hippocampal neurons alters expression of SME member Apc, resulting in synaptic dysfunction including immature spine morphology and dampened excitatory synaptic transmission concomitant with decreased PSD-95 clustering and GluA1 surface expression. Our findings indicate that very simple chemistry on RNA molecules such as adding -CH3 moiety can have far reach impact on brain development and cognitive function.

7. Yasuda, SY; Ikeda, T; Shahsavarani, H; Yoshida, N; Nayer, B; Hino, M; Vartak-Sharma, N; Suemori, H; Hasegawa, K; ***2018, Nature Biomedical Engineering,*** 2, 173-182. Chemically defined and growth-factor-free culture system for the expansion and derivation of human pluripotent stem cells.
   This paper reports NR5A1 gene and protein function in chemically-induced naive state of human pluripotent stem cells. In order to identify the function, we have applied several chemicals in combination of epigenetic analysis and transcriptome analysis. This study is matched to iCeMS concept "Comprehension and utilization of cells" of the integration of cell science and material science.

8. Hidaka, T; Pandian, GN; Taniguchi, J; Nobeyama, T; Hashiya, K; Bando, T; Sugiyama, H; ***2017, Journal of the American Chemical Society,*** 139, 8444-8447. Creation of a Synthetic Ligand for Mitochondrial DNA Sequence Recognition and Promoter-Specific Transcription Suppression.
   Mitochondria play a pivotal role in cellular homeostasis and possess multiple copies of their own DNA that encode 37 genes. However, no synthetic ligands were known to trigger targeted transcription inside the formidable double-membrane architecture of mitochondria. Taking cues from the natural cellular environment, our group created a first-ever designer molecule termed MITO-PIP that can 1) selectively localize inside mitochondrion, 2) recognize the target DNA sequence and 3) trigger promoter-specific transcriptional suppression of ND6—a gene associated with several mitochondrial disorders in HeLa cells. This work provides a new example of creating bio-inspired synthetic materials with the therapeutic potential owing to their programmable control over mitochondrial gene transcription and cellular energy homeostasis.

9. Wang, XP; Chen, XZ; Alcantara, CCJ; Sevim, S; Hoop, M; Terzopoulou, A; de Marco, C; Hu, CZ; de Mello, AJ; Falcaro, P; Furukawa, S; Nelson, BJ; Puigmarti-Luis, J; Pane, S; ***2019, Advanced Materials***, 31, e1901592. MOFBOTS: Metal-Organic-Framework-Based Biomedical Microrobots.
   In this study, magnetic helical microstructures coated with a kind of zinc-based MOF, zeolitic imidazole framework-8 (ZIF-8), with biocompatibility characteristics and pH-responsive features,

are successfully fabricated. This highly integrated multifunctional device can swim along predesigned tracks under the control of weak rotational magnetic fields. The proposed systems can achieve single-cell targeting in a cell culture media and a controlled delivery of cargo payloads inside a complex microfluidic channel network. This new approach toward the fabrication of integrated multifunctional systems will open new avenues in soft microrobotics beyond current applications. This project is a truly multidisciplinary international collaborations between iCeMS, ETH Switzerland and TU Graz Austria.

10. Packwood, DM; Hitosugi, T; ***2018, Nature Communications,*** 9, 2469. Materials informatics for self-assembly of functionalized organic precursors on metal surfaces.
    The controlled self-assembly of molecules into desired structures is a major goal of materials science. In this paper, we develop an unsupervised machine learning method to determine how the chemical properties of organic molecules determine how they self-assemble on surfaces. From these results, we could then deduce some 'rules' for choosing molecules which assemble into desired structures. Because many functional structures within the cell consist of molecule self-assemblies, our study connects with the theme of 'Inspiration from Materials'. By using our method, we could determine ways to create such bio-active molecular self-assemblies outside of the cell.

11. Zhang, G; Hong, Y; Nishiyama, Y; Bai, SY; Kitagawa, S; Horike, S; ***2019, Journal of the American Chemical Society,*** 141, 1227-1234. Accumulation of Glassy Poly(ethylene oxide) Anchored in a Covalent Organic Framework as a Solid-State Li+ Electrolyte.
    The transport of ions in molecular assemblies is a widely required mechanism from bio-systems, to electrolytes in batteries. In order to solve the energy problem, materials that can conduct lithium ions in solids at high speed are essential to improve the performance of rechargeable batteries. In the present study, solid-state lithium ion conduction was realized by using a structure consisting only of an organic moiety and incorporating a fast transporting lithium ion moiety inside. Organic structures can be designed in a variety of configurations and can be deployed for the transport of non-lithium ions, such as sodium and magnesium ions.

12. Ikawa, K; Sugimura, K; ***2018, Nature Communications,*** 9, 3295. AIP1 and cofilin ensure a resistance to tissue tension and promote directional cell rearrangement.
    The global patterns of forces in a tissue control many aspects of development including cell proliferation, cell rearrangement, and cell polarity. Here, we address the question in the Drosophila wing epithelium, where anisotropic tissue tension orients cell rearrangements. We found that anisotropic tissue tension localizes AIP1, a cofactor of cofilin, on the remodeling junction via cooperative binding of cofilin to F-actin. AIP1 and cofilin promote actin turnover and locally regulate the Afadin-mediated linkage between actomyosin and the junction. This mechanism is essential for cells to resist the mechanical load imposed on the remodeling junction perpendicular to the direction of tissue stretching. Thus, the present study delineates how AIP1 and cofilin achieve an optimal balance between resistance to tissue tension and morphogenesis. The present study integrates physical and biological perspectives of morphogenesis.

13. Takemoto, Y; Mao, D; Punzalan, LL; Gotze, S; Sato, S; Uesugi, M; ***2020***, ***Journal of the American Chemical Society***, 142, 1142. Discovery of a Small-Molecule-Dependent Photolytic Peptide.
    Uesugi Group serendipitously discovered an unprecedented short peptide tag that induces photodegradation of proteins in the presence of YM-53601, a small-molecule inhibitor of squalene synthase (SQS). Remarkably, when the 27 amino acid peptide was fused to green fluorescent protein or unrelated proteins at either the NH2 or COOH terminus, such fusion proteins were selectively photo-depleted when the cells were treated with YM-53601. The pair of the peptide and YM-53601 paves the way for the design of a new small-molecule-controlled optogenetic tool.

14. Kodan, A; Yamaguchi, T; Nakatsu, T; Matsuoka, K; Kimura, Y; Ueda, K; Kato, H; ***2019, Nature Communications,*** 10, 88. Inward- and outward-facing X-ray crystal structures of homodimeric P-glycoprotein CmABCB1.

    P-glycoprotein (MDR1, ABCB1) extrudes a large variety of xenobiotics, thereby protecting humans from their toxic effects. We determined a pair of structures of P-glycoprotein: an outward-facing (post-transport) conformational state and an inward-facing (pre-transport) state, at high resolutions and revealed the machinery underlying unidirectional multidrug pumping for the first time. This study allows us to understand how proteins recognize chemicals with various structures.

15. Galbraith, KK; Fujishima, K; Mizuno, H; Lee, SJ; Uemura, T; Sakimura, K; Mishina, M; Watanabe, N; Kengaku, M; ***2018, Cell Reports,*** 24, 95, MTSS1 Regulation of Actin-Nucleating Formin DAAM1 in Dendritic Filopodia Determines Final Dendritic Configuration of Purkinje Cells.

    Neurons in the brain build complex neural networks via connection of elaborate branches. The shape of neuronal branches is determined by microfilaments made of actin homopolymer chains which can be bundled or branched to flexibly change their shape. Kawabata Galbraith et al. discovered a novel molecular switch which regulates branch shape by changing the balance between bundled and branched actin polymers. Using single molecule imaging, they observed the interaction of actin and regulatory proteins during actin polymerization.

16. Zheng, YT; Sato, H; Wu, PY; Jeon, HJ; Matsuda, R; Kitagawa, S; ***2017, Nature Communications,*** 8, 100-105. Flexible Interlocked Porous Frameworks Allow Quantitative Photoisomerization in a Crystalline Solid.

    Cells have mechanisms to respond against various external stimuli such as heat and light. Here, we report a strategy to realize a photo-responsive porous coordination polymer (PCP) showing quantitative reversible photochemical reactions upon ultraviolet and visible light irradiation by introducing structural flexibility into a porous framework with a twofold interpenetration composed of a diarylethene-based ligand. The CO2 sorption on the PCP is reversibly modulated by light irradiation. frameworks.

17. Kurumisawa, Y; Higashino, T; Nimura, S; Tsuji, Y; Iiyama, H; Imahori, H; ***2019, Journal of the American Chemical Society,*** 141, 9910- 9919. Renaissance of Fused Porphyrins: Substituted Methylene-Bridged Thiophene-Fused Strategy for High-Performance Dye-Sensitized Solar Cells.

    Inspired by light-harvesting and charge separation in natural photosynthetic cells, artificial porphyrin sensitizers have made a remarkable contribution to performance improvement in dye-sensitized solar cells (DSSCs). We have synthesized a series of substituted methylene-bridged thiophene-fused porphyrins. After optimization, DSSC with the donor-side thiophene-fused DfZnP-iPr achieved a power conversion efficiency of 10.1%, a representative high-performance push−pull-type porphyrin sensitizer. Furthermore, cosensitization of DfZnP-iPr with a complementary sensitizer LEG4 led to a power conversion efficiency of 10.7%, which is the highest value ever reported for DSSCs with fused porphyrin sensitizers. Therefore, our strategy will reboot the exploration of aromatic- fused porphyrin sensitizers for high-performance DSSCs.

18. Zhang, ZJ; Karimata, I; Nagashima, H; Muto, S; Ohara, K; Sugimoto, K; Tachikawa, T; ***2019, Nature Communications,*** 10, 4832. Interfacial oxygen vacancies yielding long-lived holes in hematite mesocrystal-based photoanodes.

    Hematite (α-Fe2O3) is one of the most promising candidates as a photoanode materials for solar water splitting. Owing to the difficulty in suppressing the significant charge recombination, however, the photoelectrochemical (PEC) conversion efficiency of hematite is still far below the theoretical limit. We reported thick hematite films constructed by highly ordered and intimately attached hematite mesocrystals for highly efficient PEC water oxidation. In this paper, our group has clarified the local structure of mesocrystal hematite incorporating a boundary region that contributes to the improvement of PEC function by a pare distribution function analysis using synchrotron radiation

X-ray. Visualizing the principle of the photocatalytic reaction expressed by the meso region is the development of an important method that leads to the understanding of the cell chemistry principle.

19. Carne-Sanchez, A; Craig, GA; Larpent, P; Hirose, T; Higuchi, M; Kitagawa, S; Matsuda, K; Urayama, K; Furukawa, S; ***2018, Nature Communications,*** 9, 2506. Self-assembly of metal-organic polyhedra into supramolecular polymers with intrinsic microporosity.
    Designed porosity in coordination materials often relies on highly ordered crystalline networks, which provide stability upon solvent removal. However, the requirement for crystallinity often impedes control of higher degrees of morphological versatility, or materials processing. In this manuscript, we described a supramolecular approach to the synthesis of amorphous polymer materials with controlled microporosity. This synthetic approach could lead to the fabrication of soft, flexible materials with permanent porosity. Towards applications in cell biology, this type of soft materials with permanent porosity would give a new platform for controlled release of bioactive molecules with materials shapability as microfibers, nanoparticles.

20. Hara, Y; Kanamori, K; Nakanishi, K; ***2019, Angewandte Chemie-International Edition,*** 58, 19047-19053. Self-Assembly of Metal-Organic Frameworks into Monolithic Materials with Highly Controlled Trimodal Pore Structures.
    Zr-based metal-organic framework using BDC-NH2 as a coordinating ligand has been synthesized in the presence of poly(propylene glycol) and dimethylformamide. The resultant monolithic macroporous solid exhibited short-range order of Zr-BDC- NH2 coordination typically denoted as metal-organic gel, MOG. Additional heat-treatment in the presence of acid mediator reorganized the nanoscale structure of MOG into highly crystalline Zr-terephthalate-based MOF (UiO-66-NH2) without sacrificing the monolithic structures and mesoporous substructures. Macropores can accommodate large biological entities such as exosome and living cells to be interacted with the surface of highly controlled MOF structures.

2. Major Invited Lectures, Plenary Addresses (etc.)

*List up to 10 main presentations made between FY 2017 and FY 2019 in order from most recent.
*For each, write the date(s), lecturer/presenter's name, presentation title and conference name.

Date(s)	Lecturer/Presenter's name	Presentation title	Conference name
2019/12/16	Sugiyama Hiroshi	Chemical Biology of Nucleic Acids: DNA Origami and Artificial Genetic Switch	IUPAC International Symposium on Bioorganic Chemistry (ISBOC-12)
2019/12/9	Fukazawa Aiko	Exploration of Novel π-Electron Systems toward Unusual Yet Stable Functional Materials	18th Asian Chemical Congress
2019/9/25	Furukawa Shuhei	Porous soft matters assembled from metal-organic cages	Chemical Science Functional Organic Materials Symposium
2019/7/11	Kamei Ken-ichiro	Reverse bioengineering to learn from nature of tissue development and its application	Seminar at San Diego Zoo Institute for Conservation Research
2019/5/13	Kitagawa Susumu	Welcome to Small Spaces - Chemistry and Application of Porous Coordination Polymers /Metal-Organic Frameworks -	Emanuel Merck Lectureship 2019
2019/2/13	Kitagawa Susumu	Welcome to Small Spaces -Gas Science and Technology for Sustainable Future -	GRAND PRIX 2018 Fondation de la Maison de la Chimie
2018/12/12	Sugimura Kaoru	The physical and biological basis of tissue growth	RIKEN Interdisciplinary Theoretical and Mathematical Sciences Program Special Lecture
2018/2/3	Furukawa Shuhei	Photoactive metal-organic frameworks for cell biology applications	IBMD Research Week – APEC Symposium
2017/10/20	Namasivayam Ganesh Pandian	Smart Genetic Switches-Science and Surprises	Popular Science -2017 by District Science Centre, National Council of Science Museums in India
2017/9/5	Tamanoi Fuyuhiko	Nanoparticle-based Cancer Therapy	Cancer Research and Regenerative Medicine, Vietnam National University-Ho Chi Minh city

3. Major Awards

*List main awards received between FY 2017 and FY 2019 in order from the most recent.
*For each, write the date issued, recipient's name and the name of award. In case of multiple recipients, underline those affiliated with the Center.

Date	Recipient's name	Name of award
2020/2/19	Fujita Daishi	The Chemical Society of Japan (CSJ) Award for Young Chemists
2019/12/9	Furukawa Shuhei	Asian Rising Stars Lectureship at 18th Asian Chemical Congress
2019/11/17	Fukazawa Aiko	Brilliant Female Researchers Award (The JST President Award)
2018/12/6	Koichiro Tanaka	Nishina Memorial Prize
2018/11/3	Kageyama Ryoichiro	Medal with Purple Ribbon
2018/3/20	Sugiyama Hiroshi	The Chemical Society of Japan (CSJ) Award
2017/11/3	Hashida Mitsuru	Medal with Purple Ribbon
2017/9/28	Kitagawa Susumu	The 2017 Chemistry for the Future Solvay Prize
2017/4/26	Uesugi Motonari	Ichimura Prize in Science
2017/4/19	Ueda Kazumitsu	Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology

Appendix 2 FY 2019 List of Principal Investigators

NOTE:
*Underline names of principal investigators who belong to an overseas research institution.
*Indicate newly added researchers in FY 2019 (2019.4.1-2020.3.31) in the "Notes" column.

<Principal Investigators at the end of FY 2019> **Principal Investigators Total: 31**

Name	Age	Affiliation (Position title, department, organization)	Academic degree, Specialty	Effort (%)*	Starting date of participation	Status of participation (Describe in concrete terms)	Note
Kitagawa Susumu	68	Director, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Coordination Chemistry	60	Oct. 1, 2007	Director Usually stays at the center	
Kengaku Mineko	53	Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Developmental Neurobiology	60	Oct. 1, 2008	Deputy Director Usually stays at the center	
Sivaniah Easan	48	Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph. D. Physics	60	July 1, 2013	Usually stays at the center	
Suzuki Jun	42	Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Medical Biochemistry, Cell Membrane Biology	60	January 1, 2017	Deputy Director Usually stays at the center	
Fukazawa Aiko	40	Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Organic Chemistry	60	November 1, 2018	Usually stays at the center	
Tamanoi Fuyuhiko	72	Program-Specific Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Nanoparticles and Cancer Therapy	36	April 1, 2017	Cross-appointed with UCLA	
Ueda Kazumitsu	66	Program-Specific Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Cellular Bio-chemistry	60	Oct. 1, 2007	Research Administrative Director Usually stays at the center	

Nakanishi Kazuki	59	Program-Specific Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Sol-Gel Science, Porous Materials	12	August. 1, 2019	Cross-appointed with Nagoya University	New
Furukawa Shuhei	42	Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Chemistry of Molecular Assemblies	60	October 1, 2010	Usually stays at the center	
Horike Satoshi	42	Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Materials Chemistry	60	January 1, 2017	Usually stays at the center	
Kamei Kenichiro	44	Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Microengineering, Stem Cell Research	60	May 24, 2010	Usually stays at the center	
Wang Dan Ohtan	44	Program-Specific Research Center Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Neuroscience	60	May 1, 2011	Usually stays at the center	
Sugimura Kaoru	41	Program-Specific Research Center Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Biophysics, Developmental Biology	60	April 1, 2011	Usually stays at the center	
Fujita Daishi	36	Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Supramolecular Chemistry, Chemical Biology	60	April 1, 2018	Usually stays at the center	
Sugimoto Kunihisa	47	Program-Specific Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. X-ray Crystallography, Synchrotron Science	24	January 1, 2019	Cross-appointed with Spring-8	

Packwood Daniel Miles	34	Junior Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Applied Mathematics and Theoretical Chemistry	60	April 1, 2016	PI Board Chair Usually stays at the center	
Hasegawa Koichi	47	Program-Specific Research Center Junior Assistant Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Stem Cell Biology, Stem Cell Engineering, Developmental Biology	60	April 17, 2011	Usually stays at the center	
Namasivayam Ganesh Pandian	40	Junior Associate Professor, Institute for Integrated Cell-Material Sciences, Institute for Advanced Study, Kyoto University	Ph.D. Bio-inspired therapeutics, Epigenetics	60	October 1, 2010	Usually stays at the center	
Uesugi Motonari	53	Professor, Institute for Chemical Research, Kyoto University	Ph.D. Chemical Biology	32	Oct. 1, 2007	Deputy Director Joins Executive Board meeting Adjunct PI	
Kageyama Ryoichiro	63	Professor, Institute for Frontier Life and Medical Sciences, Kyoto University	M.D. Ph.D. Developmental Biology	10	Feb. 2, 2013	Adjunct PI	
Imahori Hiroshi	58	Professor, Graduate School of Engineering, Kyoto University	Ph.D. Organic Chemistry	10	Oct. 1, 2007	Adjunct PI	
Sugiyama Hiroshi	63	Professor, Graduate School of Science, Kyoto University	Ph.D. Chemical Biology	10	Apr. 1, 2008	Adjunct PI	
Tanaka Motomu	49	Professor, Center for Integrative Medicine and Physics, Institute for Advanced Study, Kyoto University	Ph.D. Medical Physics, Soft Matter Physics	10	Apr. 1, 2018	Adjunct PI	

Tanaka Koichiro	57	Professor, Graduate School of Science, Kyoto University	Ph.D. Terahertz Optical Science	10	Apr. 1, 2008	Adjunct PI	
Mori Yasuo	60	Professor, Graduate School of Engineering, Kyoto University	M.D. Ph.D. Molecular Biology	10	Apr. 1, 2017	Adjunct PI	
Abe Ryu	46	Professor, Graduate School of Engineering, Kyoto University	Ph.D. Artificial photosynthesis, Solar hydrogen production, Photocatalysts	10	Apr. 1, 2017	Adjunct PI	
Kitagawa Hiroshi	58	Professor, Graduate School of Science, Kyoto University	Ph.D. Solid-state Chemistry: Electron-proton Coupled System	10	May 1, 2017	Adjunct PI	
Hamachi Itaru	59	Professor, Graduate School of Engineering, Kyoto University	Ph.D. Chemical Biology, Supramolecular Biomaterials	10	May 1, 2017	Adjunct PI	
Kageyama Hiroshi	50	Professor, Graduate School of Engineering, Kyoto University	Ph.D. Solid-state Chemistry	10	May 1, 2017	Adjunct PI	
Matsuda Michiyuki	61	Professor, Graduate School of Biostudies, Kyoto University	Ph.D. Bio-imaging, Visualization of inter- and intra-cellular signal transduction	10	May 1, 2017	Adjunct PI	
Carlton Peter	46	Associate Professor, Graduate School of Biostudies, Kyoto University	Ph. D. Molecular and Cell Biology	10	Mar. 1,2010	Adjunct PI	

*Percentage of time that the principal investigator devotes to his/her work for the Academy center vis-à-vis his/her total working hours.

Principal Investigators resigned since FY 2017

Appendix 2

Name	Next Affiliation (Position title, department, organization)	Period of participation
Hirori Hideki	Associate Professor, Institute for Chemical Research, Kyoto University	2008.4.1-2017.6.30
Nishida Eisuke	Team Leader, Laboratory for Molecular Biology of Aging, Center for Biosystems Dynamics Research, RIKEN	2017.4.1-2018.3.31
Saitou Mitinori	Professor, Institute for Advanced Synthesis of Human Biology, Institute for Advanced Study, Kyoto University	2015.1.16-2019.3.31

Appendix 3-1 Record of Center Activities (FY 2017-FY 2019)

1. Researchers and Center Staffs, Satellites, Partner Institutions

1-1. Researchers and Center Staffs Participated in the Center's Activities

- Enter the number of researchers and center staffs affiliated with the Center in the table in Appendix 3-1a.

Special mention

- Describe the Center's concrete plans for the future and already-established schedules for employing researchers, particularly principal investigators.
- As background to how the Center is working on the global circulation of world's best brains, give good examples, if any, of how career paths are being established for the Center's researchers; that is, from which top-world research institutions do researchers come to the Center and to which research institutions do the Center's researchers go, and how long are their stays at those institutions.
- In Appendix 3-1b, describe the positions that postdoctoral researchers acquire upon leaving the Center.

A new PI who specializes in the imaging of cellular functions will join on October 1.

1-2. Satellites and Partner Institutions

- List the satellite and partner institutions, both domestic and overseas, in the table below.
- Indicate newly added and deleted institutions in the "Notes" column.

<Satellite institutions>

Institution name	Principal Investigator(s), if any	Notes
Smart Material Research Center, VISTEC (Thailand)	Horike Satoshi (PI)	Overseas Satellite 1 Kyoto University On-site Laboratory Since 2018.8
Center for Integrated Biosystems, Academia Sinica (Taiwan)	Suzuki Jun (PI)	Overseas Satellite 2 Kyoto University On-site Laboratory Since 2019.12
Kyoto University Shanghai Lab, Fudan University (China)	Uesugi Motonari (Adjunct PI)	Overseas Satellite 3 Kyoto University On-site Laboratory Since 2017.7
Quantum Nano Medicine Research Center, UCLA (USA)	Tamanoi Fuyuhiko (PI)	Kyoto University On-site Laboratory (Inbound type) Since 2019.10
Smolab (Small Molecular Lab), CNRS (France)	Furukawa Shuhei (PI)	LIA (International Associated Laboratory) Since 2019.1

< Partner institutions>

Institution name	Principal Investigator(s), if any	Notes
G-CHAIN (Center for Highly Advanced Integration of Nano and Life Sciences), Gifu University	Ando Hiromune	Since 2017.4
ChEM-OIL (AIST-Kyoto University Chemical Energy Materials Open Innovation Laboratory)	Horike Satoshi (PI)	Since 2017.4
CiMPhy (Center for Integrative Medicine and Physics)	Tanaka Motomu (Adjunct PI)	Since 2018.4
ZEISS-iCeMS Innovation Core, Carl Zeiss (Germany)	Kengaku Mineko (PI)	Since 2019.10

2. Status of Collaboration with Overseas Satellites

2-1. Coauthored Papers

- List the refereed papers published between FY 2017 and FY 2019 that were coauthored between the Center's researcher(s) in domestic institution(s) (include satellite institutions) and overseas satellite institution(s). List them by overseas satellite institution in the below blocks.
- Transcribe data in same format as in Appendix 1. Italicize the names of authors affiliated with overseas satellite institutions.

Overseas Satellite 1: Smart Material Research Center (VISTEC) (Total: 10 papers)

1) Pattanasattayavong, P; Packwood, DM; Harding, DJ; ***2019, Journal of Materials Chemistry C,*** 7, 12907-12917. Structural versatility and electronic structures of copper(I) thiocyanate (CuSCN)-ligand complexes
2) Jumpathong, W; Pila, T; Lekjing, Y; Chirawatkul, P; Boekfa, B; Horike, S; Kongpatpanich, K; ***2019, APL Materials,*** 7, 111109. Exploitation of missing linker in Zr-based metal-organic framework as the catalyst support for selective oxidation of benzyl alcohol
3) Pukdeejorhor, L; Adpakpang, K; Ponchai, P; Wannapaiboon, S; Ittisanronnachai, S; Ogawa, M; Horike, S; Bureekaew, S; ***2019, Crystal Growth & Design,*** 19, 5581-5591. Polymorphism of Mixed Metal Cr/Fe Terephthalate Metal-Organic Frameworks Utilizing a Microwave Synthetic Method
4) Lee, JSM; Sarawutanukul, S; Sawangphruk, M; Horike, S; ***2019, ACS Sustainable Chemistry & Engineering,*** 7, 4030-4036. Porous Fe-N-C Catalysts for Rechargeable Zinc-Air Batteries from an Iron-Imidazolate Coordination Polymer
5) Wechwithayakhlung, C; Packwood, DM; Chaopaknam, J; Worakajit, P; Ittisanronnachai, S; Chanlek, N; Promarak, V; Kongpatpanich, K; Harding, DJ; Pattanasattayavong, P; ***2019, Journal of Materials Chemistry C,*** 7, 3452-3462. Tin(II) thiocyanate Sn(NCS)(2) - a wide band gap coordination polymer semiconductor with a 2D structure
6) Adpakpang, K; Pratanpornlerd, W; Ponchai, P; Tranganphaibul, W; Thongratkaew, S; Faungnawakij, K; Horike, S; Siritanon, T; Rujiwatra, A; Ogawa, M; Bureekaew, S; ***2018, Inorganic Chemistry,*** 57, 13075-13078. Unsaturated Mn(II)-Centered [Mn(BDC)](n) Metal-Organic Framework with Strong Water Binding Ability and Its Potential for Dehydration of an Ethanol/Water Mixture
7) Fujiwara, Y; Lee, JSM; Tsujimoto, M; Kongpatpanich, K; Pila, T; Iimura, K; Tobori, N; Kitagawa, S; Horike, S; ***2018, Chemistry of Materials,*** 30, 1830-1834. Fabrication of epsilon-Fe2N Catalytic Sites in Porous Carbons Derived from an Iron-Triazolate Crystal
8) Chiochan, P; Kaewruang, S; Phattharasupakun, N; Wutthiprom, J; Maihom, T; Limtrakul, J; Nagarkar, S; Horike, S; Sawangphruk, M; ***2017, Scientific Reports,*** 7, 17703. Chemical Adsorption and Physical Confinement of Polysulfides with the Janus-faced Interlayer for High-performance Lithium-Sulfur Batteries
9) Phattharasupakun, N; Wutthiprom, J; Kaenket, S; Maihom, T; Limtrakul, J; Probst, M; Nagarkar, SS; Horike, S; Sawangphruk, M; ***2017, Chemical Communications,*** 53, 11786-11789. A proton-hopping charge storage mechanism of ionic one-dimensional coordination polymers for high-performance supercapacitors
10) Kadota, K; Sivaniah, E; Bureekaew, S; Kitagawa, S; Horike, S; ***2017, Inorganic Chemistry,*** 56, 8744-8747. Synthesis of Manganese ZIF-8 from [Mn(BH4)(2)center dot 3THF]center dot NaBH4

Overseas Satellite 2: Center for Integrated Biosystems (Academia Sinica) (Total: 0 papers)

Overseas Satellite 3: Kyoto University Shanghai Lab (Fudan University) (Total: 6 papers)

1) Zhang, XD; Jiang, LL; Huang, K; Fang, CT; Li, J; Yang, JT; Li, HT; Ruan, XX; Wang, PH; Mo, MG; Wu, P; Xu, YH; Peng, C; Uesugi, M; Ye, DY; Yu, FX; Zhou, L; ***2020, ACS Chemical Biology,*** 15, 632-639. Site-Selective Phosphoglycerate Mutase 1 Acetylation by a Small Molecule
2) Takemoto, Y; Mao, D; Punzalan, LL; Gotze, S; Sato, S; Uesugi, M; ***2020, Journal of the American Chemical Society,*** 142, 1142-1146. Discovery of a Small-Molecule-Dependent Photolytic Peptide
3) Nagata, A; Akagi, Y; Asano, L; Kotake, K; Kawagoe, F; Mendoza, A; Masoud, SS; Usuda, K; Yasui, K; Takemoto, Y; Kittaka, A; Nagasawa, K; Uesugi, M; ***2019, ACS Chemical Biology,*** 14, 2851-

2858. Synthetic Chemical Probes That Dissect Vitamin D Activities
4) Furuta, T; Mizukami, Y; Asano, L; Kotake, K; Ziegler, S; Yoshida, H; Watanabe, M; Sato, S; Waldmann, H; Nishikawa, M; Uesugi, M; *2019, ACS Chemical Biology,* 14, 1860-1865. Nutrient-Based Chemical Library as a Source of Energy Metabolism Modulators
5) Takashima, I; Kusamori, K; Hakariya, H; Takashima, M; Vu, TH; Mizukami, Y; Noda, N; Takayama, Y; Katsuda, Y; Sato, S; Takakura, Y; Nishikawa, M; Uesugi, M; *2019, ACS Chemical Biology,* 14, 775-783. Multifunctionalization of Cells with a Self-Assembling Molecule to Enhance Cell Engraftment
6) Yatsuzuka, K; Sato, S; Pe, KB; Katsuda, Y; Takashima, I; Watanabe, M; Uesugi, M; *2018, Chemical Communications,* 54, 7151-7154. Live-cell imaging of multiple endogenous mRNAs permits the direct observation of RNA granule dynamics

On-site laboratory (Inbound type): Quantum Nano Medicine Research Center (UCLA) (Total: 9 papers)

1) Stauber, JM; Qian, EA; Han, YX; Rheingold, AL; Kral, P; Fujita, D; Spokoyny, AM; *2020, Journal of the American Chemical Society,* 142, 327-334. An Organometallic Strategy for Assembling Atomically Precise Hybrid Nanomaterials
2) Tamanoi, F; Matsumoto, K; Doan, TLH; Shiro, A; Saitoh, H; *2020, Nanotechnology.* Convergence of the Study on Monochromatic X-rays and the Research on Nanoparticles Opens Up a Possibility to Develop a New Type of Radiation Therapy
3) Matsumoto, K; Saitoh, H; Doan, TLH; Shiro, A; Nakai, K; Komatsu, A; Tsujimoto, M; Yasuda, R; Kawachi, T; Tajima, T; Tamanoi, F; *2019, Scientific Reports,* 9, 13275. Destruction of tumor mass by gadolinium-loaded nanoparticles irradiated with monochromatic X-rays: Implications for the Auger therapy
4) Komatsu, A; Matsumoto, K; Saito, T; Muto, M; Tamanoi, F; *2019, Cells,* 8, 440. Patient Derived Chicken Egg Tumor Model (PDcE Model): Current Status and Critical Issues
5) Mekaru, H; Yoshigoe, A; Nakamura, M; Doura, T; Tamanoi, F; *2019, ACS Applied Nano Materials,* 2, 479-488. Biodegradability of Disulfide-Organosilica Nanoparticles Evaluated by Soft X-ray Photoelectron Spectroscopy: Cancer Therapy Implications
6) Merkurjev, D; Hong, WT; Iida, K; Oomoto, I; Goldie, BJ; Yamaguti, H; Ohara, T; Kawaguchi, SY; Hirano, T; Martin, KC; Pellegrini, M; Wang, DO; *2018, Nature Neuroscience,* 21, 1004-1014. Synaptic N-6-methyladenosine (m(6)A) epitranscriptome reveals functional partitioning of localized transcripts
7) Vu, BT; Shahin, SA; Croissant, J; Fatieiev, Y; Matsumoto, K; Doan, TLH; Yik, T; Simargi, S; Conteras, A; Ratliff, L; Jimenez, CM; Raehm, L; Khashab, N; Durand, JO; Glackin, C; Tamanoi, F; *2018, Scientific Reports,* 8, 8524. Chick chorioallantoic membrane assay as an in vivo model to study the effect of nanoparticle-based anticancer drugs in ovarian cancer
8) Heard, JJ; Phung, I; Potes, MI; Tamanoi, F; *2018, BMC Cancer,* 18, 69. An oncogenic mutant of RHEB, RHEB Y35N, exhibits an altered interaction with BRAF resulting in cancer transformation
9) Nakano, H; Minami, I; Braas, D; Pappoe, H; Wu, XJ; Sagadevan, A; Vergnes, L; Fu, K; Morselli, M; Dunham, C; Ding, XQ; Stieg, AZ; Gimzewski, JK; Pellegrini, M; Clark, PM; Reue, K; Lusis, AJ; Ribalet, B; Kurdistani, SK; Christofk, H; Nakatsuji, N; Nakano, A; *2017, eLife,* 6, e29330. Glucose inhibits cardiac muscle maturation through nucleotide biosynthesis

International Associated Laboratory: Smolab (CNRS) (Total: 1 papers)

1) Itakura, T; Matsui, H; Tada, T; Kitagawa, S; Demessence, A; Horike, S; *2020, Chemical Science,* 11, 1538-1541. The role of lattice vibration in the terahertz region for proton conduction in 2D metal-organic frameworks

2-2. Status of Researcher Exchanges

- Using the below tables, indicate the number of researcher exchanges between the Center (include domestic satellite institutions) and overseas satellite institutions during the period of FY 2017-FY 2019. Enter by institution and fiscal year.
- Write the number of principal investigator visits in the upper space and the number of other researcher visits in the lower space.

Overseas Satellite 1: Smart Material Research Center (VISTEC)

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	5	5	7	17
Other researchers	3	3	5	11
Total	8	8	12	28

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators	2	3	1	6
Other researchers	3	2	4	9
Total	5	5	5	15

Overseas Satellite 2: Center for Integrated Biosystems (Academia Sinica)

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators			14	14
Other researchers			2	2
Total			16	16

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators			11	11
Other researchers			0	0
Total			11	11

Overseas Satellite 3: Kyoto University Shanghai Lab

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators		12	10	22
Other researchers		0	0	0
Total		12	10	22

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators		13	10	23
Other researchers		3	3	6
Total		16	13	29

On-site laboratory (Inbound type): Quantum Nano Medicine Research Center (UCLA)

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators			3	3
Other researchers			0	0
Total			3	3

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators			7	7
Other researchers			0	0
Total			7	7

International Associated Laboratory: Smolab (CNRS)

<To overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators		1	0	1
Other researchers		0	1	1
Total		1	1	2

<From overseas satellite>

	FY 2017	FY 2018	FY 2019	Total
Principal investigators		1	3	4
Other researchers		0	1	1
Total		1	4	5

3. Holding and Participating in International Research Meetings

3-1. Holding international Research Meetings

- Indicate the number of international research conferences or symposiums held between FY 2017 and FY 2019, and give up to five examples of the most representative ones using the table below.

FY 2017: 5 meetings	FY 2018: 6 meetings	FY 2019: 7 meetings
Major examples (meeting titles, places and dates held)		Number of participants
4th iCeMS-VISTEC Joint Symposium for Materials and Energy Sciences (Aug 22 2018; VISTEC)		From domestic institutions: 10 From overseas institutions: 40
24th iCeMS International Symposium "Emerging Science for Unlocking Cell's Secrets"(Sep 3-4 2018; iCeMS)		From domestic institutions: 66 From overseas institutions: 11
25th iCeMS International Symposium "Harnessing Physical Forces for Medical Application: Convergence of Physics, Nanomaterials, Cell Biology and Cancer Research"(Nov 15-16 2018; California Nano Systems Institute (CNSI) of UCLA)		From domestic institutions: 13 From overseas institutions: 167
ZEISS-iCeMS Innovation Core Founding Commemorative Symposium (Oct 28 2019; iCeMS)		From domestic institutions: 34 From overseas institutions: 6
2nd Kyoto University-Academia Sinica Bilateral Symposium (Dec 18 2019; iCeMS)		From domestic institutions: 14 From overseas institutions: 9

3-2. Participating in International Research Meetings

- Give up to five examples of the most representative case in which the Center, not individual researchers, participated in international research meetings to enhance the visibility and brand of the Center or of the overall WPI Program

Meeting titles, places, dates held and number of participants	Form of participation (e.g. operating a booth)	Number of participants from the Center
NanoMat 2017 (May 17-19 2017; I2CNER Kyushu University)	Oral Presentation and Poster Presentation	7
AAAS 2019 Annual Meeting (Feb 14-17; Washington, DC)	Operating a booth	2
E-MRS 2018 (June 18-22 2018; Strasbourg)	Organizing a workshop and operating a booth	2
E-MRS 2019 (May 27-31 2019; Nice)	Oral Presentation	2
NanoMat 2019 (June 3-5; Paris)	Oral Presentation	2

4. List of the Cooperative Research Agreements with Overseas Institutions

- Indicate the number of agreements concluded with overseas institutions still in effect as of the end of FY 2019 (March 31, 2020). Give five examples of the most representative agreements.

Number of effective agreements (as of March 31, 2019): 15 (including a University-level agreement with Academia Sinica, Taiwan)

Five examples of the most representative agreements:

1. Name of the Agreement: THE INSTITUTE FOR INTEGRATED CELL-MATERIAL SCIENCES (iCeMS), KYOTO UNIVERSITY AND THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, ON BEHALF OF ITS LOS ANGELES CAMPUS, USA AND ON BEHALF OF THE CALIFORNIA NANOSYSTEMS INSTITUTE (CNSI)

   Dates of the Agreement: March 15, 2010

   Counterpart in the Agreement: California NanoSystems Institute (CNSI), University of California, Los Angeles, USA

   Summary of the Agreement: The MOU serves as a written understanding of agreed upon principles between the Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University and the California NanoSystems Institute, University of California, Los Angeles (UCLA) concerning a set of general academic objectives.　Both institutions agree to explore the development of the following types of activities:

   - Visits and informal exchanges of faculty, scholars, and administrators in specific areas of education, research, and outreach.
   - Cooperation on postgraduate education and training.
   - Organization of joint conferences, symposia, or other scientific meetings on subjects of mutual interest.
   - Exchange of academic information and materials.
   - Pursuit of avenues for graduate and professional student exchange during the academic year or summer terms.
   - Exploration of possibilities for developing joint research programs and collaboration.
   - Other exchange and cooperation programs to which both parties agree.

   This collaboration leads two parties to establish an On-site Laboratory named Quantum Nano Medicine Research Center located in Japan.

2. Name of the Agreement: MEMORANDUM OF UNDERSTANDING BETWEEN THE INSTITUTE FOR INTEGRATED CELL-MATERIAL SCIENCES (iCeMS), KYOTO UNIVERSITY AND THE EXECUTIVE COUNCIL OF VIDYASIRIMEDHI INSTITUTE OF SCIENCE AND TECHNOLOGY (VISTEC), THAILAND

   Dates of the Agreement: February 29, 2016

   Counterpart in the Agreement: Vidyasirimedhi Institute of Science and Technology（VISTEC）, Thailand

   Summary of the Agreement: The MOU serves as a written understanding of agreed upon principles between the Institute for Integrated Cell-Material Sciences (iCeMS) of Kyoto University and Vidyasirimedhi Institute of Science and Technology (VISTEC) concerning a set of general academic objectives.　Both institutions agree to explore the development of the following types of activities:

   - Visits and informal exchanges of faculty, scholars, and administrators in specific areas of education, research, and outreach;
   - Cooperation on postgraduate education and training;
   - Organization of joint conferences, symposia, or other scientific meetings on subjects of mutual interest;
   - Exchange of academic information and materials;
   - Pursuit of avenues for graduate and professional student exchange during the academic year or summer vacation period;
   - Exploration of possibilities for the development of joint research programs and collaboration; and
   - Other exchange and cooperation programs to which both parties agree.

   This collaboration leads two parties to establish an On-site Laboratory named Smart Materials

Research Center located in Thailand.

3. Name of the Agreement: GENERAL MEMORANDUM FOR ACADEMIC COOPERATION AND EXCHANGE BETWEEN THE KYOTO UNIVERSITY INSTITUTE FOR ADVANCED STUDY KYOTO UNIVERSITY, JAPAN AND THE SCHOOL OF PHYSICAL SCIENCE AND TECHNOLOGY SHANGHAITECH UNIVERSITY, CHINA
   Dates of the Agreement: July 3, 2018
   Counterpart in the Agreement: School of Physical Science and Technology, ShanghaiTech University, China
   Summary of the Agreement: The Kyoto University Institute for Advanced Study and the School of Physical Science and Technology of ShanghaiTech University concluded an agreement for academic exchange and cooperation. Two parties will promote in particular the following activities:
   - Exchange of scientific materials, publications, and information
   - Exchange of faculty members and researchers
   - Exchange of students
   - Joint research and meetings for research.

   This collaboration started when Dr. Franklin Kim, who had been an associate professor of iCeMS, was assigned to the associate professor of the School of Physical Science and Technology of ShanghaiTech University. This is an outstanding example of international brain circulation.

4. Name of the Agreement: General Memorandum for Academic Cooperation and Exchange between The Kyoto University Institute for Advanced Study (KUIAS), Kyoto University, Japan and King Abdullah University of Science and Technology (KAUST), Saudi Arabia
   Dates of the Agreement: October 23, 2019
   Counterpart in the Agreement: King Abdullah University of Science and Technology, Saudi Arabia
   Summary of the Agreement: The Kyoto University Institute for Advanced Study and King Abdullah University of Science and Technology concluded an agreement for academic cooperation and exchange in the field of advanced energy materials for energy efficiency, renewable energy harvesting, and new energy carriers. Two parties will promote in particular the following activities:
   - Exchange of scientific materials, publications, and information
   - Exchange of faculty members and researchers
   - Exchange of students
   - Joint research and meetings for research.

   After this agreement, Prof Furukawa in iCeMS was decided to accept a subaward by KAUST for three years from 2020.

5. Name of the Agreement: General Memorandum for Academic Cooperation and Exchange between Academia Sinica and Kyoto University
   Dates of the Agreement: December 18, 2019
   Counterpart in the Agreement: Academia Sinica, Taiwan
   Summary of the Agreement: Academia Sinica and Kyoto University conclude an agreement for academic cooperation and exchange between the two institutions. Two parties will promote in particular the following activities:
   - Exchange of scientific materials, publications, and information
   - Exchange of faculty members and researchers
   - Exchange of students
   - Joint research and meetings for research.

   On the basis of this collaboration, two parties have established an On-site Laboratory named Center for Integrated Biosystems located in Taiwan.

5. Postdoctoral Positions through Open International Solicitations

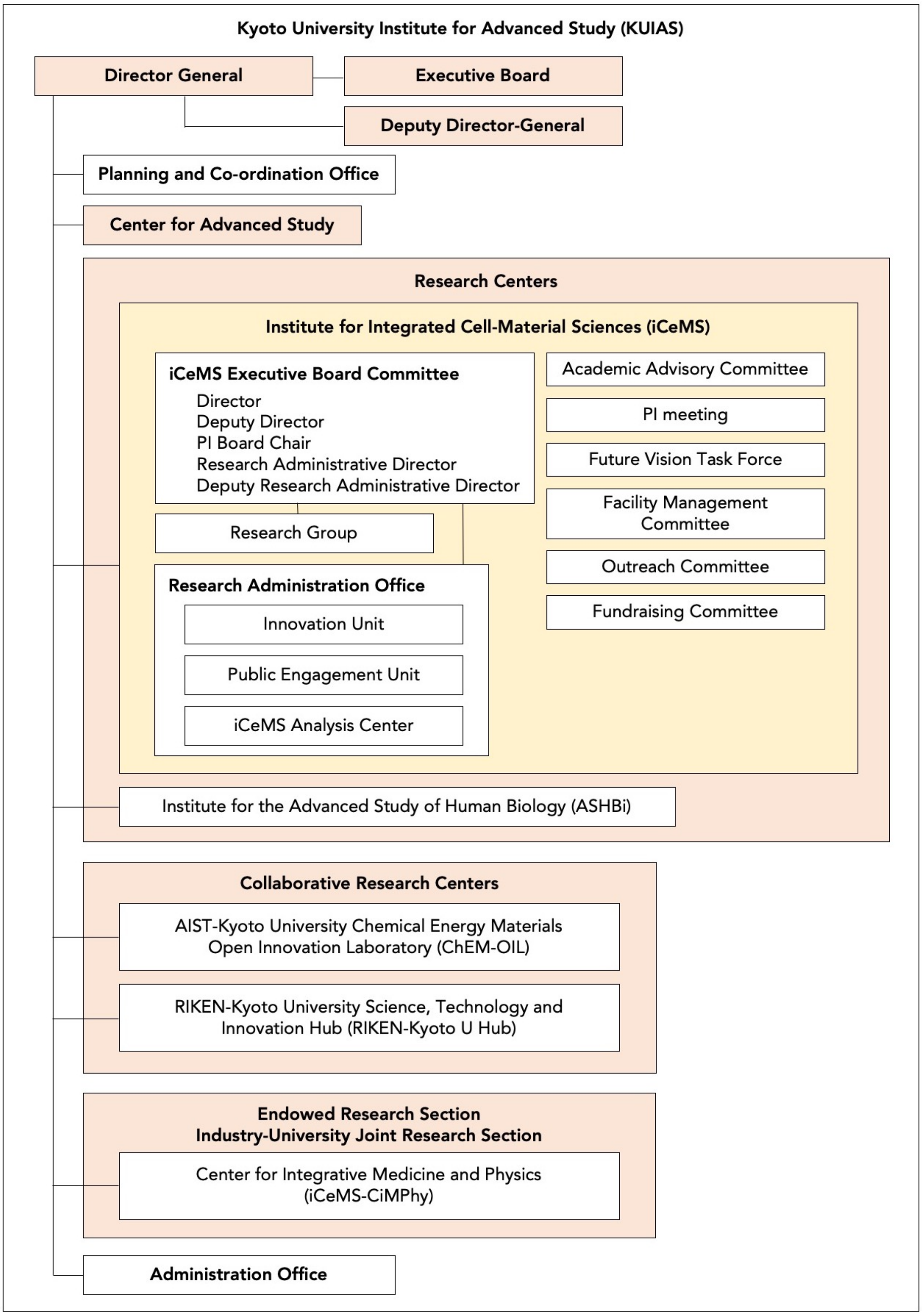
- In the columns "number of applications" and "number of selections," put the total number (upper) and the number and percentage of overseas researchers in the < > brackets (lower).
- In Appendix 3b, describe the status of employment of postdoctoral researchers.

Fiscal year	Number of applications	Number of selections
FY 2016	49	10
	〈46, 94%〉	〈9, 90%〉
FY 2017	78	8
	〈67, 86%〉	〈4, 50%〉
FY 2018	72	11
	〈65, 90%〉	〈11, 100%〉
FY 2019	53	17
	〈47, 89%〉	〈14, 82%〉

6. Diagram of Management System

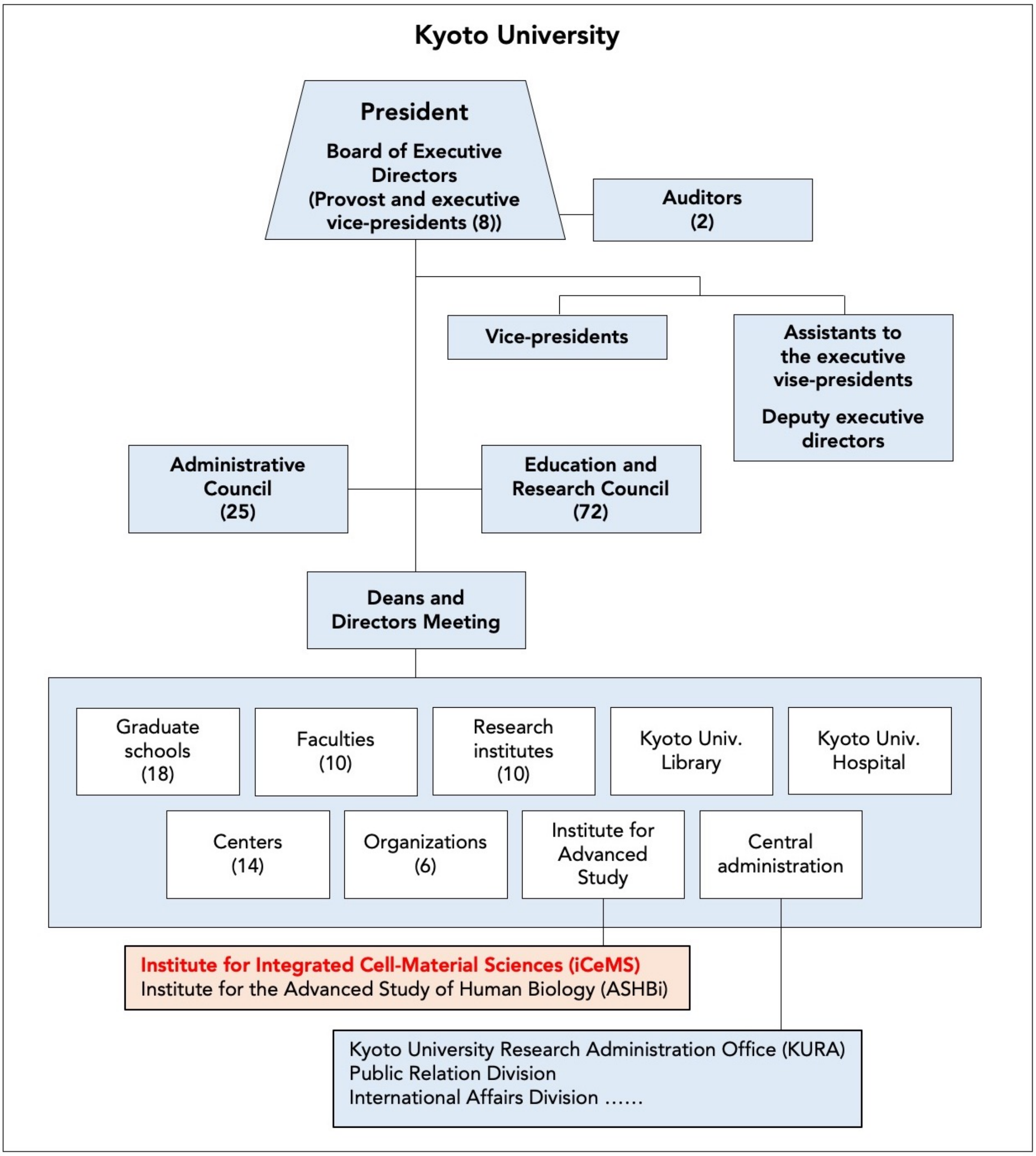
6-1.

- Diagram the Center's management system within the Center in an easily understood manner.
- If any changes have been made in the Center's management system vis-à-vis that stated in the application for WPI Academy center certification, describe them. Especially describe any important changes made in such as the center director, administrative director, head of host institution, and officer(s) in charge at the host institution (e.g., executive vice president for research).



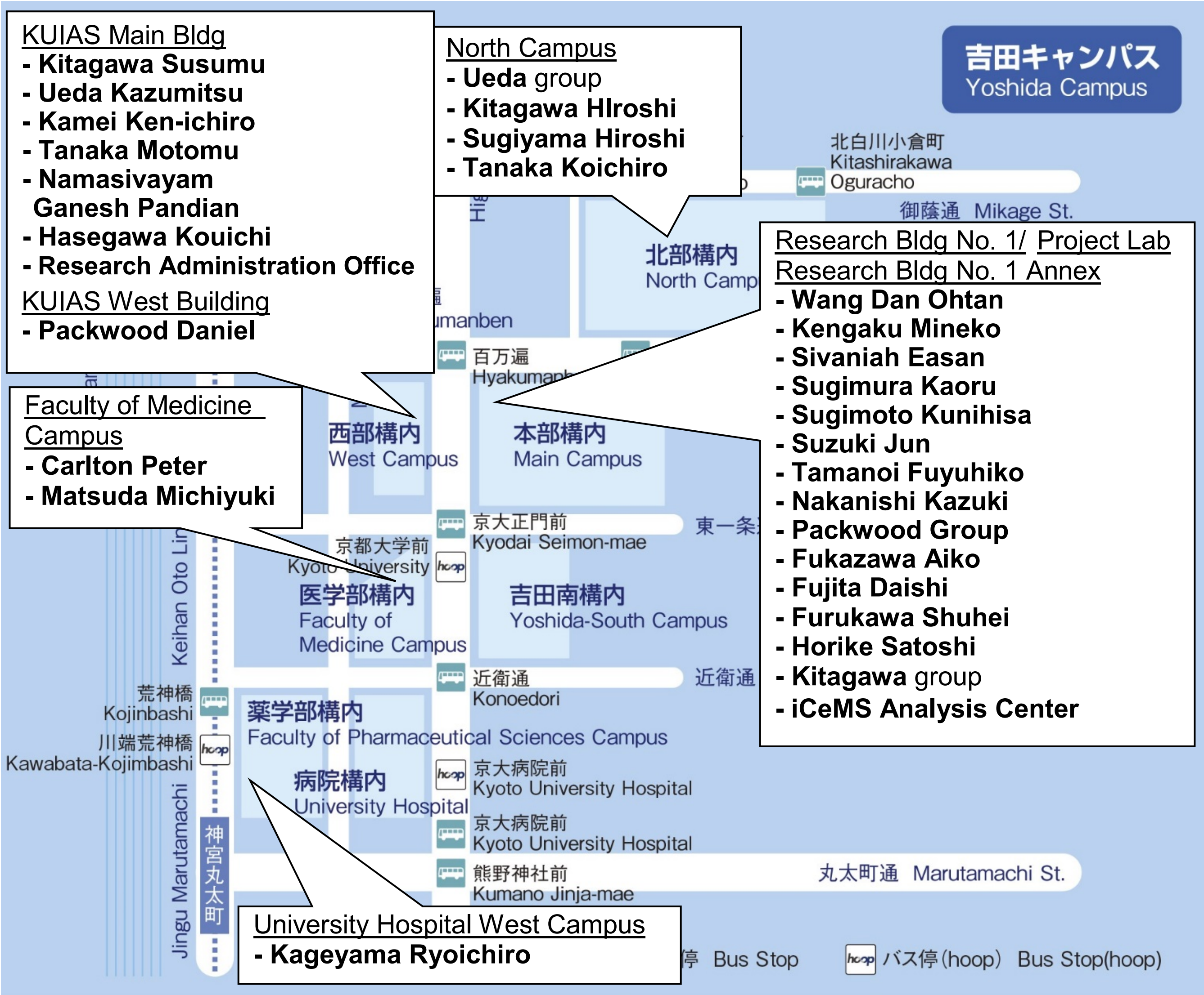
As of FY2019, Deputy Research Administrative Director has been put in iCeMS Executive Board. Three committees have been also placed, which include PIs, the RAO members, and the KUIAS Administration Office members.

6-2.
- Make a diagram of the organizational chart to show Center's position within the host institution.



7. Campus Map

- Draw a simple map of the campus showing where the main office and principal investigator(s) are located.



KUIAS Main Bldg
- Kitagawa Susumu
- Ueda Kazumitsu
- Kamei Ken-ichiro
- Tanaka Motomu
- Namasivayam Ganesh Pandian
- Hasegawa Kouichi
- Research Administration Office
KUIAS West Building
- Packwood Daniel
North Campus
- Ueda group
- Kitagawa HIroshi
- Sugiyama Hiroshi
- Tanaka Koichiro
吉田キャンパス
Yoshida Campus
北白川小倉町
Kitashirakawa Oguracho
御蔭通 Mikage St.
北部構内
North Camp
Research Bldg No. 1/ Project Lab
Research Bldg No. 1 Annex
- Wang Dan Ohtan
- Kengaku Mineko
- Sivaniah Easan
- Sugimura Kaoru
- Sugimoto Kunihisa
- Suzuki Jun
- Tamanoi Fuyuhiko
- Nakanishi Kazuki
- Packwood Group
- Fukazawa Aiko
- Fujita Daishi
- Furukawa Shuhei
- Horike Satoshi
- Kitagawa group
- iCeMS Analysis Center
百万遍
Hyakumanb
Faculty of Medicine Campus
- Carlton Peter
- Matsuda Michiyuki
西部構内
West Campus
本部構内
Main Campus
京大正門前
Kyodai Seimon-mae
京都大学前
医学部構内
Faculty of Medicine Campus
吉田南構内
Yoshida-South Campus
Keihan Oto Lin
荒神橋
Kojinbashi
川端荒神橋
Kawabata-Kojimbashi
近衛通
Konoedori
近衛通
薬学部構内
Faculty of Pharmaceutical Sciences Campus
病院構内
University Hospital
京大病院前
Kyoto University Hospital
京大病院前
Kyoto University Hospital
熊野神社前
Kumano Jinja-mae
丸太町通 Marutamachi St.
Jingu Marutamachi
神宮丸太町
University Hospital West Campus
- Kageyama Ryoichiro
Bus Stop
バス停(hoop) Bus Stop(hoop)

Appendix3-1a Number of Center Personnel FY2016-FY2019

	FY2016		FY2017		FY2018		FY2019	
	Number of persons	%	Number of persons	%	Number of persons	%	Number of persons	%
Researchers	109		65		75		87	
Overseas researchers	26	23.9%	16	24.6%	22	29.3%	22	25.3%
Female researchers	25	22.9%	13	20.0%	19	25.3%	20	23.0%
Principal investigators (PIs)	25		27		29		31	
Overseas PIs	5	20.0%	3	11.1%	4	13.8%	4	12.9%
Female PIs	2	8.0%	3	11.1%	4	13.8%	4	12.9%
Other researchers	44		19		28		34	
Overseas researchers	5	11.4%	3	15.8%	5	17.9%	4	11.8%
Female researchers	13	29.5%	7	36.8%	8	28.6%	11	32.4%
Postdocs	40		19		18		22	
Overseas Postdocs	16	40.0%	10	52.6%	13	72.2%	14	63.6%
Female Postdocs	10	25.0%	3	15.8%	7	38.9%	5	22.7%
Research support staff	83		48		57		69	
Administrative staff	15		15		23		24	
TOTAL	207		128		155		180	

* "Principal investigators" includes the adjunct PIs.

Number of persons who were/have been paid using the host institution's operating budget (excluding indirect funding) among the above persons.

	FY2016	FY2017	FY2018	FY2019
Principal investigators (PIs)	0	25	29	26
Other researchers	3	1	17	9
Postdocs	1	0	8	1
Research support staff	0	1	3	2
Administrative staff	0	10	17	17

※ Make consistent with the number of persons reported in Appendix 3-2.

* The number of “Administrative staff” in this document (Appendix 3-1a) only counts the staff members who directly belong to the KUIAS or iCeMS, while Appendix 3-2 includes the members of the common administrative staff in charge of several other departments in addition to the KUIAS/iCeMS staff. Therefore, the numbers differ in the two Appendices.

Changes vis-à-vis the Center's application for academy center certification

※ If changes have been made vis-à-vis the Center's application for academy center certification, describe the main changes and the reasons for them.

Appendix 3-1b Career Path of WPI Postdocs

Enter the information below during the period from the start of the center through the end of FY 2019.
- For each person, fill in the spaces to the right. More spaces may be added.
- Leave "Position as of April 2020" blank if unknown.

Japanese Postdocs

Employment period	Position before employed at WPI center		Next position after WPI center		Position as of April 2020*	
	Position title, organization	Country where the organization is located	Position title, organization	Country where the organization is located	Position title, organization	Country where the organization is located
2018/5/1-present	JSPS(PD), Nagoya Institute of Technology	Japan			Program Specific Researcher, iCeMS	Japan
2015/12/01-2017/6/30	Government official, Nara Prefectural Office	Japan	Team leader, Shiseido	Japan		
2016/08/01-2018/06/30	Embryologist, In vitro fertilization clinic	Japan	Dispatched researcher, Technopro R&D	Japan		
2018/07/01-2019/12/31	Researcher and lecturer, OBM research center	Japan	Lead Researcher, Foundation for Biomedical Research and Innovation at Kobe	Japan		
2019/6/1-2020/3/31			Assistant Professor, Kanazawa University	Japan		
2009/4/1-2017/9/1			Postdoc, Ohtan G, iCeMS	Japan	Assistant Professor, Tokushima University	Japan
2017/4/1-2017/9/1			Postdoc, Tsukuba University	Japan	Same	
2018/4/1-2018/12/1			Postdoc, German Center for Neurodegenerative Diseases	Germany		Switzerland
2016/4/1-2018/3/31	PhD Tokyo University	Japan	Program Specific Researcher Tokyo University	Japan	Program Specific Assistant Professor, Nara Institute of Science and Technology	Japan
2014/10/1-2018/3/31	Researcher Tsukuba University	Japan	Assistant Professor Nagoya University	Japan	Assistant Professor Nagoya University	Japan
2014/4/1-2016/4/1	JST Sakigake researcher		Lecturer, University of Hyogo			
2017/01/01-2017/9/30	None		Assistant Prof, Konan university	Japan		
2014/4/1-	PhD Student, Kyoto Univ.	Japan	NA		Program Specific Researcher(Post-doc),Kyoto Univ.	Japan
2015/5/1-	Postdoc	Japan			Postdoc	Japan
2017/4/1	Postdoc	Japan	Assistant Professor, Tokushima University	Japan	Assistant Professor	Japan

Overseas Postdocs

Employment period	Position before employed at WPI center		Next position after WPI center		Position as of April 2020*		Nationality
	Position title, organization	Country where the organization is located	Position title, organization	Country where the organization is located	Position title, organization	Country where the organization is located	
2018/10/01-2020/03/31	Graduate student, Nagaoka University of Technology	Japan	Researcher, BioVerde	Japan			Vietnam
2016/4/1-2019/3/31			Assistant Professor, Nanjing Univ. of Science and Technology, China	China			China
2017-2019			Postdoc, The University of Tokyo	Japan			UK
2015-2019			Assistant Professor, IIT Bombay	India			India
2017-2018			Postdoc, Seoul National University	Korea			China
2018.4-2019.1			Postdoc, Max Planck Institute of Neurobiology	Germany	Same		China
2016/7/16-2018/3/31	PhD, Nankai University	China	Assistant Professor Liaocheng University	China	Assistant professor, Guangxi Normal University	China	Chinese
2018/11/25-2020/11/24	Assistant Professor Chinese Academy of Sciences	China	JSPS Post Doctoral Fellowship Kyoto University	Japan	JSPS Post Doctoral Fellowship Kyoto University	Japan	Chinese
2019/9/1-2020/3/31	PhD University of Limerick	Ireland	JSPS Post Doctoral Fellowship	Japan	JSPS Post Doctoral Fellowship	Japan	India
2016/7/1-2017/10/25	JSPS Post Doctoral Fellowship, Institute for Molecular Science, National Institutes of Natural Science	Japan	Professor South China University of Technology	China	Professor South China University of Technology	China	Chinese
2014/12/16-2018/3/31	Project Scientist Indian Institute of Technology Kanpur	India	Visiting Fellow College of Arts and Sciences, American University of Sharjah	UAE	Visiting Fellow College of Arts and Sciences, American University of Sharjah	UAE	India
2014/11/16-2017/1/31	Researcher Soongsil University	Korea	Research Fellow Center for Self-assembly and Complexity (CSC) under Institute for Basic Science	Korea	Research Fellow Center for Self-assembly and Complexity (CSC) under Institute for Basic Science	Korea	Korean
2015.9-2017/3/31	Post Doctoral Researcher Northeast Normal University	China	Assistant Professor Northeast Normal University	China	Assistant Professor Northeast Normal University	China	Chinese
2015.1-2016.12	Ph.D University Lyon	France	Collaborative Researcher between Air Liquide Laboratories and iCeMS	Japan	Collaborative Researcher between Air Liquide Laboratories and iCeMS	Japan	French
2018	Program-Specific Research Associate, Graduate of Science	Japan	Postdoctoral Scientist	United Kingdom	Program-Specific Research Associate, Institute for Advanced Study	Japan	Chinese
2019	Program-Specific Research Associate, Institute for Advanced Study	Japan			Program-Specific Research Associate, Institute for Advanced Study	Japan	Indian
2019					Part-time Academic Staff, Institute for Advanced Study	Japan	Indian
2016.7-2018.6	Postdoctoral researcher, Chinese Academy of Sciences	China	?		?		China
2018.9- present	Central Salt and Marine Chemicals Research Institute	India	Still works at iCeMS				
2016/9/1-2017/10/31	None		Postdoc, Soochow University	China			China

2015/10/1-2018/6/30	None		Postdoc, Kwansei gakuin university	Japan			Nepal
2016/01/01-2018/9/30	None						Indonesia
2017/05/05-2018/03/31	None		JSPS Fellow	Japan	JSPS Fellow	Japan	Iran
2019.4-present	PhD Student, University Paris Diderot (Paris VII),.	France	NA		JSPS Postdoctoral Fellow、Kyoto Univ.	Japan	French
2017/10/1-2018/12/31	Program Specified Researcher	Vietnam	Senior Researcher, INOMAR	Vietnam	Senior Researcher, INOMAR	Vietnam	Vietnam
2018/2/1-2019/1/31	Program Specified Researcher	France	Researcher, Oz Biosciences	France	Researcher, Oz Biosciences	France	France
2018/10/16-2019/1/31	Graduate, ph D. degree	Japan					China
2019/4/1-2019/12/31	PhD	India					India
2015/5/19-2017/5/18	Ph.D.	Australia	Postdoctoral research fellow	Australia	Postdoc	Australia	Australia
2019/8/1-present	Research Associate - 1	India			Postdoc	Japan	India
2012-2017	Graduate student,. U. Queensland	Australia	Postdoctoral fellow, University of Sydney	Australia	Postdoctoral fellow, University of Sydney	Australia	Australian

Project Expenditures FY2016

(Thousand yens)

	Amount	Details	Operational subsidies to National University Corporations/Incorporated Administrative Agency		Funding by WPI Academy		Government Subsidies except Funding from WPI Academy		Donations		Indirect funding		Joint research projects		Competitive funding		Others	
			Total costs	Details (no. of persons)	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details
Personnel	28,067	Operational subsidies to National University Corporations/Incorporated Administrative Agency		Center director			24,160	Center director 1										
	-	Funding by WPI Academy		Administrative director			13,142	Administrative direct 1										
	866,251	Government Subsidies except Funding from WPI Academy	-	Principal investigators 0	-	Principal investigators 0	200,545	Principal investigator 24	-	0	-	0	-	0	-	0	-	0
	-	Donations		・Full-time／Japanese		・Full-time／Japanese	97,397	・Full-time／Japane 12										
	-	Indirect funding		・Concurrent／Japanese		・Concurrent／Japanese	47,887	・Concurrent／Japa 6										
	-	Joint research projects		・Full-time／Overseas		・Full-time／Overseas	49,673	・Full-time／Overse 5										
	-	Competitive funding		・Concurrent／Overseas		・Concurrent／Overseas	5,588	・Concurrent／Over 1										
	-	Others	4,405	Other researchers 3	-	Other researchers 0	166,426	Other researchers 25	-	0	-	0	-	0	-	0	-	0
			1,166	・Associate professor /Assistant professor 1		・Associate professor /Assistant professor	50,859	・Associate professor /Assistant professor 7										
			3,239	・Others 2		・Others	115,567	・Others 18										
			951	Postdocs 1		Postdocs	158,445	Postdocs 42										
				Research support staff		Research support staff	105,223	Research support staff 76										
			22,711	Administrative staff 13		Administrative staff	198,310	Administrative staff 35										
Subtotal	894,318		28,067	17	-	0	866,251	204	-	0	-	0	-	0	-	0	-	0
Project activities	24,756	Operational subsidies to National University Corporations/Incorporated Administrative Agency	24,756	Project activities			49,028	Dispatch of scientists and Research support staff			4,812	Project activities						
	-	Funding by WPI Academy						Research startup cost										
	329,645	Government Subsidies except Funding from WPI Academy					50,000	Satellites										
	-	Donations					2,573	International symposiums										
	4,812	Indirect funding					1,475	Rental fees for facilities										
	-	Joint research projects					38,904	Consumables										
	-	Competitive funding					73,425	Utility costs										
	-	Others					114,240	Others										
Subtotal	359,213		24,756		-		329,645		-		4,812		-		-		-	
Travel	5,281	Operational subsidies to National University Corporations/Incorporated Administrative Agency	5,281	Travel			26,156	Travel										
	-	Funding by WPI Academy																
	26,156	Government Subsidies except Funding from WPI Academy																
	-	Donations																
	-	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	-	Others																
Subtotal	31,437		5,281		-		26,156		-		-		-		-		-	
Equipment	-	Operational subsidies to National University Corporations/Incorporated Administrative Agency					1,987	Fume hoods			1,325	video conference system						
	-	Funding by WPI Academy					1,410	high and low-pressure gas supply panel			1,021	Others						
	19,049	Government Subsidies except Funding from WPI Academy					1,065	Cell culture system										
	-	Donations					14,587	Others										
	2,346	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	-	Others																
Subtotal	21,395		-		-		19,049		-		2,346		-		-		-	
Research projects	-	Operational subsidies to National University Corporations/Incorporated Administrative Agency							62,900				170,742		546,743	Grants-in-aid in scientific research		
	-	Funding by WPI Academy													523,446	Commissioned research		
	-	Government Subsidies except Funding from WPI Academy													15,644	Commissioned project		
	62,900	Donations																
	-	Indirect funding																
	170,742	Joint research projects																
	1,085,833	Competitive funding																
	-	Others																
Subtotal	1,319,475		-		-		-		62,900		-		170,742		1,085,833		-	
Others	-	Operational subsidies to National University Corporations/Incorporated Administrative Agency																
	-	Funding by WPI Academy																
	-	Government Subsidies except Funding from WPI Academy																
	-	Donations																
	-	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	-	Others																
Subtotal	-		-		-		-		-		-		-		-		-	
Total	2,625,838		58,104		-		1,241,101		62,900		7,158		170,742		1,085,833		-	

Operational subsidies to National University Corporations/Incorporated Administrative Agency	運営費交付金
Funding by WPI Academy	WPIアカデミー国際頭脳循環の加速・拡大事業
Government Subsidies except Funding from WPI Academy	機関補助金（WPIアカデミー国際頭脳循環の加速・拡大事業を除く）
Donations	寄付金
Indirect funding	間接経費
Joint research projects	共同研究費
Competitive funding	競争的資金
Others	その他

Project Expenditures FY2017

(Thousand yens)

	Amount	Details	Operational subsidies to National University Corporations/Incorporated Administrative Agency: Total costs	Operational subsidies: Details (no. of persons)	Funding by WPI Academy: Total costs	Funding by WPI Academy: Details	Government Subsidies except Funding from WPI Academy: Total costs	Government Subsidies except Funding from WPI Academy: Details	Donations: Total costs	Donations: Details	Indirect funding: Total costs	Indirect funding: Details	Joint research projects: Total costs	Joint research projects: Details	Competitive funding: Total costs	Competitive funding: Details	Others: Total costs	Others: Details
Personnel	340,375	Operational subsidies to National University Corporations/Incorporated Administrative Agency	16,409	Center director 1														
	-	Funding by WPI Academy		Administrative director			10,740	Administrative direct 1										
	44,389	Government Subsidies except Funding from WPI Academy	168,634	Principal investigators 24	-	Principal investigators 0	-	Principal investigator 0	-	0	-	0	-	0	-	0	14,994	Principal investigator 3
	-	Donations	63,409	・Full-time／Japanese 7		・Full-time／Japanese											14,994	・Full-time／Japane 3
	-	Indirect funding	82,141	・Concurrent／Japanese 14		・Concurrent／Japanese												
	-	Joint research projects	18,769	・Full-time／Overseas 2		・Full-time／Overseas												
	-	Competitive funding	4,315	・Concurrent／Overseas 1		・Concurrent／Overseas												
	51,283	Others	15,887	Other researchers 1	-	Other researchers 0	9,110	Other researchers 1	-	0	-	0	-	0	-	0	27,006	Other researchers 5
				・Associate professor /Assistant professor		・Associate professor /Assistant professor	9,110	・Associate professor /Assistant professor 1									27,006	・Others 5
			15,887	・Others 1		・Others		・Others										
			1,036	Postdocs		Postdocs	10,528	Postdocs 2										
			2,543	Research support staff 1		Research support staff	5,146	Research support staff 2										
			135,866	Administrative staff 45		Administrative staff	8,865	Administrative staff 2									9,283	Administrative staffs 2
Subtotal	436,047		340,375	72	-	0	44,389	8	-	0	-	0	-	0	-	0	51,283	10
Project activities	96,745	Operational subsidies to National University Corporations/Incorporated Administrative Agency	96,745	Project activities		Dispatch of scientists and Research support staff	327	Dispatch of scientists and Research support staff			65,784	Project activities					34,490	Project activities
	21,874	Funding by WPI Academy				Research startup cost												
	5,193	Government Subsidies except Funding from WPI Academy				Satellites												
	-	Donations			554	International symposiums												
	65,784	Indirect funding			3,183	Retreat												
	-	Joint research projects			5,456	Consumables	606	Consumables										
	-	Competitive funding			3,979	Utility costs												
	34,490	Others			8,702	Others	4,260	Others										
Subtotal	224,086		96,745		21,874		5,193		-		65,784		-		-		34,490	
Travel	832	Operational subsidies to National University Corporations/Incorporated Administrative Agency	832	Travel	11,374	Travel	418	Travel			2,160	Travel					1,038	Travel
	11,374	Funding by WPI Academy																
	418	Government Subsidies except Funding from WPI Academy																
	-	Donations																
	2,160	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	1,038	Others																
Subtotal	15,822		832		11,374		418		-		2,160		-		-		1,038	
Equipment	-	Operational subsidies to National University Corporations/Incorporated Administrative Agency			4,402	Fluorescent illuminating device for inverted microscope												
	13,220	Funding by WPI Academy			3,985	Electric inverted microscope												
	-	Government Subsidies except Funding from WPI Academy			1,391	High pressure method osmometer												
	-	Donations			3,442	Others												
	-	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	-	Others																
Subtotal	13,220		-		13,220		-		-		-		-		-		-	
Research projects	20,014	Operational subsidies to National University Corporations/Incorporated Administrative Agency	20,014						50,402		76,405		106,737		403,696	Grants-in-aid in scientific research		
	-	Funding by WPI Academy													492,207	Commissioned research		
	-	Government Subsidies except Funding from WPI Academy													5,800	Commissioned project		
	50,402	Donations													5,420	The program for promoting the enhancement of research universities		
	76,405	Indirect funding													31,414	Others		
	106,737	Joint research projects																
	938,537	Competitive funding																
	-	Others																
Subtotal	1,192,095		20,014		-		-		50,402		76,405		106,737		938,537		-	
Others	-	Operational subsidies to National University Corporations/Incorporated Administrative Agency			532	Consumption tax												
	532	Funding by WPI Academy																
	-	Government Subsidies except Funding from WPI Academy																
	-	Donations																
	-	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	-	Others																
Subtotal	532		-		532		-		-		-		-		-		-	
Total	1,881,802		457,966		47,000		50,000		50,402		144,349		106,737		938,537		86,811	

Operational subsidies to National University Corporations/Incorporated Administrative Agency	運営費交付金
Funding by WPI Academy	WPIアカデミー国際頭脳循環の加速・拡大事業
Government Subsidies except Funding from WPI Academy	機関補助金（WPIアカデミー国際頭脳循環の加速・拡大事業を除く）
Donations	寄付金
Indirect funding	間接経費
Joint research projects	共同研究費
Competitive funding	競争的資金
Others	その他

Project Expenditures FY2018

（Thousand yens）

	Amount	Details	Operational subsidies to National University Corporations/Incorporated Administrative Agency		Funding by WPI Academy		Government Subsidies except Funding from WPI Academy		Donations		Indirect funding		Joint research projects		Competitive funding		Others	
			Total costs	Details (no. of persons)	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details	Total costs	Details
Personnel	465,493	Operational subsidies to National University Corporations/Incorporated Administrative Agency	16,409	Center director 1														
	-	Funding by WPI Academy		Administrative director			10,764	Administrative direct 1										
	39,158	Government Subsidies except Funding from WPI Academy	210,585	Principal investigators 28	-	Principal investigators 0	-	Principal investigator 0	-	0	-	0	-	0	-	0	-	Principal investigator 0
	-	Donations	99,245	・Full-time／Japanese 11		・Full-time／Japanese												
	-	Indirect funding	74,148	・Concurrent／Japanese 13		・Concurrent／Japanese												
	-	Joint research projects	32,475	・Full-time／Overseas 3		・Full-time／Overseas												
	-	Competitive funding	4,717	・Concurrent／Overseas 1		・Concurrent／Overseas												
	18,987	Others	76,545	Other researchers 17	-	Other researchers 0	-	Other researchers 0	-	0	-	0	-	0	-	0	13,225	Other researchers 2
			74,462	・Associate professor /Assistant professor 1		・Associate professor /Assistant professor											8,028	・Associate professor /Assistant professor 1
			2,083	・Others 16		・Others											5,197	・Others 1
			19,432	Postdocs 8		Postdocs											4,574	Postdocs 1
			4,615	Research support staff 3		Research support staff	28,394	Research support staff 6									1,188	Research support staff 1
			137,907	Administrative staff 48		Administrative staff		Administrative staff										Administrative staff
Subtotal	523,638		465,493	105	-	0	39,158	7	-	0	-	0	-	0	-	0	18,987	4
Project activities	306,335	Operational subsidies to National University Corporations/Incorporated Administrative Agency	306,335	Project activities		Dispatch of scientists and Research support staff	1,803	Dispatch of scientists and Research support staff			73,981	Project activities					20,391	Project activities
	18,292	Funding by WPI Academy				Research startup cost												
	5,005	Government Subsidies except Funding from WPI Academy				Satellites												
	-	Donations			737	International symposiums												
	73,981	Indirect funding			2,754	Retreat												
	-	Joint research projects			7,434	PR & outreach												
	-	Competitive funding			2,595	Utility costs												
	20,391	Others			4,772	Others	3,202	Others										
Subtotal	424,004		306,335		18,292		5,005		-		73,981		-		-		20,391	
Travel	3,552	Operational subsidies to National University Corporations/Incorporated Administrative Agency	3,552	Travel	14,905	Travel	837	Travel			2,517	Travel					448	Travel
	14,905	Funding by WPI Academy																
	837	Government Subsidies except Funding from WPI Academy																
	-	Donations																
	2,517	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	448	Others																
Subtotal	22,259		3,552		14,905		837		-		2,517		-		-		448	
Equipment	-	Operational subsidies to National University Corporations/Incorporated Administrative Agency			533	Digital single-lens reflex camera												
	533	Funding by WPI Academy																
	-	Government Subsidies except Funding from WPI Academy																
	-	Donations																
	-	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	-	Others																
Subtotal	533		-		533		-		-		-		-		-		-	
Research projects	30,962	Operational subsidies to National University Corporations/Incorporated Administrative Agency	30,962						63,728		119,646		67,659		375,527	Grants-in-aid in scientific research		
	-	Funding by WPI Academy													281,951	Commissioned research		
	-	Government Subsidies except Funding from WPI Academy													6,745	Commissioned project		
	63,728	Donations													309	Others		
	119,646	Indirect funding																
	67,659	Joint research projects																
	664,532	Competitive funding																
	-	Others																
Subtotal	946,527		30,962		-		-		63,728		119,646		67,659		664,532		-	
Others	-	Operational subsidies to National University Corporations/Incorporated Administrative Agency									8,652	Provision for costs of equipment						
	1,270	Funding by WPI Academy			1,270	Consumption tax												
	-	Government Subsidies except Funding from WPI Academy																
	-	Donations																
	8,652	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	-	Others																
Subtotal	9,922		-		1,270		-		-		8,652		-		-		-	
Total	1,926,883		806,342		35,000		45,000		63,728		204,796		67,659		664,532		39,826	

Operational subsidies to National University Corporations/Incorporated Administrative Agency	運営費交付金
Funding by WPI Academy	WPIアカデミー国際頭脳循環の加速･拡大事業
Government Subsidies except Funding from WPI Academy	機関補助金（WPIアカデミー国際頭脳循環の加速･拡大事業を除く）
Donations	寄付金
Indirect funding	間接経費
Joint research projects	共同研究費
Competitive funding	競争的資金
Others	その他

Project Expenditures FY2019

（Thousand yens）

	Amount	Details	Operational subsidies to national university corporations/incorporated administrative agency: Total costs	Operational subsidies to national university corporations/incorporated administrative agency: Details (no. of persons)	Funding by WPI Academy: Total costs	Funding by WPI Academy: Details	Government subsidies except funding from WPI Academy: Total costs	Government subsidies except funding from WPI Academy: Details	Donations: Total costs	Donations: Details	Indirect funding: Total costs	Indirect funding: Details	Joint research projects: Total costs	Joint research projects: Details	Competitive funding: Total costs	Competitive funding: Details	Others: Total costs	Others: Details
Personnel	430,112	Operational subsidies to national university corporations/incorporated administrative agency	16,417	Center director 1														
	-	Funding by WPI Academy		Administrative director			10,772	Administrative direct 1										
	37,000	Government subsidies except funding from WPI Academy	207,620	Principal investigators 25	-	Principal investigators 0	-	Principal investigator 0	5,970	Principal investigator 1	14,414	Principal investigator 3	4,382	Principal investigator 1	-	0	-	Principal investigator 0
	5,970	Donations	107,656	・Full-time／Japanese 10		・Full-time／Japanese					14,414	・Full-time／Japane 3	4,382	・Full-time／Japane 1				
	121,851	Indirect funding	62,514	・Concurrent／Japanese 11		・Concurrent／Japanese			5,970	・Concurrent／Japa 1								
	4,382	Joint research projects	32,813	・Full-time／Overseas 3		・Full-time／Overseas												
	-	Competitive funding	4,637	・Concurrent／Overseas 1		・Concurrent／Overseas												
	4,815	Others	63,747	Other researchers 9	-	Other researchers 0	-	Other researchers 0	-	Other researchers 0	50,536	Other researchers 9	-	Other researchers 0	-	0	-	Other researchers 0
			14,885	・Associate professors /Assistant professors 2		・Associate professors /Assistant professors						・Associate professors /Assistant professors						
			48,862	・Others 7		・Others					50,536	・Others 9						
			5,706	Postdocs 1		Postdocs					44,538	Postdocs 10						
			2,444	Research support staff 2		Research support staff	26,228	Research support staff 4			6,733	Research support staff 2					4,815	Research support staff 3
			134,178	Administrative staff 50		Administrative staff		Administrative staff			5,630	Administrative staff 3						
Subtotal	604,130		430,112	88	-	0	37,000	5	5,970	1	121,851	27	4,382	1	-	0	4,815	3
Project activities	31,967	Operational subsidies to national university corporations/incorporated administrative agency	31,967	Project activities	888	Dispatch of scientists and research support staff	110	Printing and binding			172,207	Project activities					11,168	Project activities
	17,470	Funding by WPI Academy				Research startup costs	133	Meetings										
	13,443	Government subsidies except funding from WPI Academy				Satellites	10,872	Consumables										
	-	Donations			233	International symposia	9	Communication and transportation										
	172,207	Indirect funding			4,274	Retreat	112	Rewards										
	-	Joint research projects			9,746	PR & outreach	2,207	Provision of services										
	-	Competitive funding			75	Utility costs												
	11,168	Others			2,254	Others												
Subtotal	246,255		31,967		17,470		13,443		-		172,207		-		-		11,168	
Travel	2,745	Operational subsidies to national university corporations/incorporated administrative agency	2,745	Travel	14,662	Travel	2,632	Travel			2,395	Travel						
	14,662	Funding by WPI Academy																
	2,632	Government subsidies except funding from WPI Academy																
	-	Donations																
	2,395	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	-	Others																
Subtotal	22,434		2,745		14,662		2,632		-		2,395		-		-		-	
Equipment	57,184	Operational subsidies to national university corporations/incorporated administrative agency	56,177	Laser confocal microscope integrated system			97,354	Solid-state NMR			6,261	Fume hoods						
	-	Funding by WPI Academy	1,007	Pure water production system			1,469	Data server			1,048	Laboratory tables						
	98,823	Government subsidies except funding from WPI Academy									5,849	Chromatographic chamber,_others						
	-	Donations																
	13,158	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	-	Others																
Subtotal	169,165		57,184		-		98,823		-		13,158		-		-		-	
Research projects	99,318	Operational subsidies to national university corporations/incorporated administrative agency	99,318						64,481		42,693		85,531		372,992	Grants-in-aid in scientific research	5,287	
	-	Funding by WPI Academy													390,644	Commissioned research		
	-	Government subsidies except funding from WPI Academy													4,393	Commissioned project		
	64,481	Donations																
	42,693	Indirect funding																
	85,531	Joint research projects																
	768,029	Competitive funding																
	5,287	Others																
Subtotal	1,065,339		99,318		-		-		64,481		42,693		85,531		768,029		5,287	
Others	-	Operational subsidies to national university corporations/incorporated administrative agency			2,276	Consumption tax											517	Consumption tax
	2,276	Funding by WPI Academy																
	-	Government subsidies except funding from WPI Academy																
	-	Donations																
	-	Indirect funding																
	-	Joint research projects																
	-	Competitive funding																
	517	Others																
Subtotal	2,793		-		2,276		-		-		-		-		-		517	
Total	2,110,116		621,326		34,408		151,898		70,451		352,304		89,913		768,029		21,787	

Operational subsidies to national university corporations/incorporated administrative agency	運営費交付金
Funding by WPI Academy	WPIアカデミー国際頭脳循環の加速・拡大事業
Government subsidies except funding from WPI Academy	機関補助金（WPIアカデミー国際頭脳循環の加速・拡大事業を除く）
Donations	寄付金
Indirect funding	間接経費
Joint research projects	共同研究費
Competitive funding	競争的資金
Others	その他

Appendix 4 Outreach Activities and Their Results

List up to three of the Center's outreach activities carried out during the period between FY 2017 and 2019 that have contributed to enhancing the brand or recognition of your Center and/or the brand of the overall WPI program, and describe its concrete contents and effect in narrative style. (Where possible, indicate the results in concrete numbers.)

Examples:
- As a result of using a new OO press-release method, a OO% increase in media coverage was obtained over the previous year.
- By holding seminars for the public that include people from industry, requests for joint research were received from companies.
- We changed our public relations media. As a resulting of using OO to disseminate information, a OO% increase in inquiries from researchers was obtained over the previous year.
- As a result of vigorously carrying out OO outreach activity, \ OO in external funding was acquired.

Enter a list of your outreach activities in Attachment 4a.

Example 1: Press Releases

Starting in 2018, iCeMS has been creating illustrations to represent its research results to add to its press releases. The illustrations have also been posted on iCeMS website, and press release sites such as EurekAlert! along with the text explanations. This is helping to increase the publicity of the research results. For example, in FY2019, 3 of iCeMS' press releases were published in the latest trends of EurekAlert, the world's largest science press release sharing platform, and 5 press releases were picked up for the top page of Asia Research News, a science press release sharing portal of Asia. English-language media tend to use the illustrations in the press releases as they are for their articles, and it seems that attractive illustrations increase the likelihood that the news will be shared. When this was done for iCeMS' latest research outcome, the altmetrics, the paper publicity index, was showing "1" for about a week until before the press release was distributed, and it increased to 75 three weeks after the release.

Example 2: iCeMS Caravan in Japan and China

Since 2016, iCeMS has held eleven workshops for high school students all over Japan. The workshops are led by iCeMS' young researchers, and in January 2019, it was held overseas for the first time, at the North Yucai School in Shenyang, China. This became a good opportunity to inform Chinese high school students about iCeMS' research and encourage them to come to Japan and participate in iCeMS in the future as postdocs or students at Kyoto University. Tweets on the day of the Caravan received about 4.5 times the average number of impressions per day of the month.

Example 3: Social Media and Website

Since FY2018, we have been using visuals to spread our message, especially on social media, where eye-catching photos and illustrations play an essential role in spreading messages. We began a project to distribute photos that convey the daily lives of iCeMS researchers, and increased the number of postings with illustrations. As a result, the number of impressions that posts show up in users' timelines increased 3.6 times in two years, from 113,349 in FY2017 to 414,536 in FY2019. Influxes of visitors to the iCeMS website have also been confirmed as a result of high-profile contents on our social media.

Appendix 4a State of Outreach Activities from FY2017 to FY2019

* For each activity, enter the number of times that the activity was held each fiscal year.

Activities	FY2017 (number of activities, times held)	FY2018 (number of activities, times held)	FY2019 (number of activities, times held)
PR brochure, pamphlet	4	7	4
Lectures, seminars for general public	11	28	19
Teaching, experiments, training for elementary, secondary and high school students	21	30	29
Science café	5	1	1
Open house	0	1	3
Participating, exhibiting in events	3	5	8
Press releases	13	17	11
Publications of popular science books	0	0	0
Others（SNS)	192	331	419
Others（Website news)	63	74	64

*If there are activities that the center hasn't implemented, delete those lines. If you have other activities, list them in the space between parentheses after "Others" and state the number of times they were held in the spaces on the right. Another line under "Others" can be added, if needed.

<Notes>

Refereed Papers published in 2017

List A: WPI papers

Article

1.	Takano, Y; Munechika, R; Biju, V; Harashima, H; Imahori, H; Yamada, Y**; *2017, Nanoscale,*** 9, 18690. Optical control of mitochondrial reductive reactions in living cells using an electron donor-acceptor linked molecule
2.	Sen, S; Hosono, N; Zheng, JJ; Kusaka, S; Matsuda, R; Sakaki, S; Kitagawa, S**; *2017, J. Am. Chem. Soc.,*** 139, 18313. Cooperative Bond Scission in a Soft Porous Crystal Enables Discriminatory Gate Opening for Ethylene over Ethane
3.	Chiochan, P; Kaewruang, S; Phattharasupakun, N; Wutthiprom, J; Maihom, T; Limtrakul, J; Nagarkar, S; Horike, S; Sawangphruk, M**; *2017, Sci Rep,*** 7, 17703. Chemical Adsorption and Physical Confinement of Polysulfides with the Janus-faced Interlayer for High-performance Lithium-Sulfur Batteries
4.	Nakano, H; Minami, I; Braas, D; Pappoe, H; Wu, XJ; Sagadevan, A; Vergnes, L; Fu, K; Morselli, M; Dunham, C; Ding, XQ; Stieg, AZ; Gimzewski, JK; Pellegrini, M; Clark, PM; Reue, K; Lusis, AJ; Ribalet, B; Kurdistani, SK; Christofk, H; Nakatsuji, N; Nakano, A**; *2017, eLife,*** 6, e29330. Glucose inhibits cardiac muscle maturation through nucleotide biosynthesis
5.	Tarekegne, AT; Hirori, H; Tanaka, K; Iwaszczuk, K; Jepsen, PU**; *2017, New J. Phys.*,** 19, 123018. Impact ionization dynamics in silicon by MV/cm THz fields
6.	Gu, YF; Wu, YN; Li, LC; Chen, W; Li, FT; Kitagawa, S**; *2017, Angew. Chem.-Int. Edit.*,** 56, 15658. Controllable Modular Growth of Hierarchical MOF-on-MOF Architectures
7.	Lee, J**; *2017, Colloid Surf. B-Biointerfaces,*** 160, 682. Protein-mimicking nanoparticles for the reproduction of transient protein-receptor interactions
8.	Thomson, NM; Sangiambut, S; Ushimaru, K; Sivaniah, E; Tsuge, T**; *2017, ACS Biomater. Sci. Eng.,*** 3, 3076. Poly(hydroxyalkanoate) Generation from Nonchiral Substrates Using Multiple Enzyme Immobilizations on Peptide Nanofibers
9.	Kotaka, M; Toyoda, T; Yasuda, K; Kitano, Y; Okada, C; Ohta, A; Watanabe, A; Uesugi, M; Osafune, K**; *2017, Sci Rep,*** 7, 16734. Adrenergic receptor agonists induce the differentiation of pluripotent stem cell-derived hepatoblasts into hepatocyte-like cells
10.	Hayano, M; Makiyama, T; Kamakura, T; Watanabe, H; Sasaki, K; Funakoshi, S; Wuriyanghai, Y; Nishiuchi, S; Harita, T; Yamamoto, Y; Kohjitani, H; Hirose, S; Yokoi, F; Chen, JR; Baba, O; Horie, T; Chonabayashi, K; Ohno, S; Toyoda, F; Yoshida, Y; Ono, K; Horie, M; Kimura, T**; *2017, Circ. J.,*** 81, 1783. Development of a Patient-Derived Induced Pluripotent Stem Cell Model for the Investigation of SCN5A-D1275N-Related Cardiac Sodium Channelopathy

11. Mitani, T; Yabuta, Y; Ohta, H; Nakamura, T; Yamashiro, C; Yamamoto, T; Saitou, M; Kurimoto, K; ***2017, Nucleic Acids Res.,*** 45, 12152. Principles for the regulation of multiple developmental pathways by a versatile transcriptional factor, BLIMP1
12. Kitao, T; Hongu, R; Kitagawa, S; Uemura, T; ***2017, Chem. Lett.,*** 46, 1705. Controlled Organization of Anthracene in Porous Coordination Polymers
13. Shirai, YM; Tsunoyama, TA; Hiramoto-Yamaki, N; Hirosawa, KM; Shibata, ACE; Kondo, K; Tsurumune, A; Ishidate, F; Kusumi, A; Fujiwara, TK; ***2017, PLoS One,*** 12, e0188778. Cortical actin nodes: Their dynamics and recruitment of podosomal proteins as revealed by super-resolution and single-molecule microscopy
14. Suda, K; Murakami, T; Gotoh, N; Fukuda, R; Hashida, Y; Hashida, M; Tsujikawa, A; Yoshimura, N; ***2017, J. Control. Release,*** 266, 301. High-density lipoprotein mutant eye drops for the treatment of posterior eye diseases
15. Willner, EM; Kamada, Y; Suzuki, Y; Emura, T; Hidaka, K; Dietz, H; Sugiyama, H; Endo, M; ***2017, Angew. Chem.-Int. Edit.,*** 56, 15324. Single-Molecule Observation of the Photoregulated Conformational Dynamics of DNA Origami Nanoscissors
16. Ikeda, H; Sone, M; Yamanaka, S; Yamamoto, T; ***2017, Nat. Commun.,*** 8, 1616. Structural and spatial chromatin features at developmental gene loci in human pluripotent stem cells
17. Isfahani, AP; Sadeghi, M; Wakimoto, K; Gibbons, AH; Bagheri, R; Sivaniah, E; Ghalei, B; ***2017, J. Membr. Sci.,*** 542, 143. Enhancement of CO2 capture by polyethylene glycol-based polyurethane membranes
18. Li, JJ; Minami, I; Shiozaki, M; Yu, LQ; Yajima, S; Miyagawa, S; Shiba, Y; Morone, N; Fukushima, S; Yoshioka, M; Li, SS; Qiao, J; Li, X; Wang, L; Kotera, H; Nakatsuji, N; Sawa, Y; Chen, Y; Liu, L; ***2017, Stem Cell Rep.,*** 9, 1546. Human Pluripotent Stem Cell-Derived Cardiac Tissue-like Constructs for Repairing the Infarcted Myocardium
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36.	Ariyoshi, J; Matsuyama, Y; Kobori, A; Murakami, A; Sugiyama, H; Yamayoshi, A**; *2017, Nucl. Acid Ther.,*** 27, 303. Effective Anti-miRNA Oligonucleotides Show High Releasing Rate of MicroRNA from RNA-Induced Silencing Complex
37.	Yu, ZT; Taniguchi, J; Wei, YL; Pandian, GN; Hashiya, K; Bando, T; Sugiyama, H**; *2017, Eur. J. Med. Chem.,*** 138, 320. Antiproliferative and apoptotic activities of sequence-specific histone acetyltransferase inhibitors
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List B: WPI-related papers

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List A: WPI papers

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Review

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Editorial Material

1.	Wu, YK; Kengaku, M; ***2018, J. Exp. Neurosci.,*** 12, 1179069518789151. Dynamic Interaction Between Microtubules and the Nucleus Regulates Nuclear Movement During Neuronal Migration
2.	Kitagawa, S; ***2018, Chem.-Asian J.,*** 13, 7, Continuous Scientific Growth through an Open-Minded Attitude

Refereed Papers published in 2018

List B: WPI-related papers

Article

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List B: WPI-related papers

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