

# FY 2019 Follow-up of WPI Program

By Program Committee

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(This document reports on progress made under the WPI Program in FY 2018.)

Α.	WPI Outline	. 2
В.	WPI Centers	. 3
C.	Follow-up framework	. 4
D.	Final evaluation on the center launched in 2010 (I <sup>2</sup> CNER)	. 6
Ε.	Extension application screening on the 3 centers launched in 2012 (IIIS, ELSI, ITbM)	. 9
F.	Future plan of the WPI Program	10
G.	Follow up on Kavli IPMU, Launched in 2007	11
Η.	Follow up on the 3 Centers Launched in 2012	13
F	I-1. IIIS	13
F	I-2. ELSI	15
F	I-3. ITbM	16
Ι.	Follow up on the 2 Centers Launched in 2017	18
ŀ	-1. IRCN	18
ŀ	2. NanoLSI	20
J.	Follow up on the 2 Centers Launched in 2018	22
J	-1. ICReDD	22
J	-2. ASHBi	25
К.	WPI Academy	28
L.	Branding and outreach	32

In 2007, the Japanese government launched an ambitious initiative to create globally visible and internationally open research centers. This program, World Premier International Research Center Initiative (abbreviated WPI), successfully concluded its first 10 years of implementation in 2016. The second decade of the program started in 2017 with the launching of 2 centers, IRCN and NanoLSI, and 2 more centers, ICReDD and ASHBi in 2018. This year is the 3<sup>rd</sup> year of the Program's second decade of operation, or the 13<sup>th</sup> year when counted from its beginning. The 2019 follow-up report describes important areas of progress achieved in FY 2018 and new developments made in FY 2019, including the final evaluation of I<sup>2</sup>CNER, the extension application screening of IIIS, ELSI, ITbM, future plan of the WPI Program, and the activities of WPI Academy.

## A. WPI Outline

In 2007, Ministry of Education, Culture, Sports, Science and Technology (MEXT) launched the WPI Program aimed at establishing internationally open and globally visible "World Premium Institutes" in Japan.

Four missions are given to WPI centers.

- Advancing to the highest pinnacle globally leading-edge research
- Creating interdisciplinary domains
- Establishing international research environments
- Reforming research organizations

MEXT supports the WPI centers within the following context.

- Up to ¥700 million a year per center in principle
- (Up to about ¥1.3 billion a year for centers launched in and before 2010)
- Research money is not included.
- Support for 10 years (5-year extension is applicable for centers launched in or before 2012)

Many countries are now carrying out Research Excellence Initiatives (REI) against the following background. The WPI Program is regarded as an REI role model.

- Increasing worldwide competition in generating new research outcomes and in recruiting talented scientists.
- Strong need felt for more efficient forms of funding to advance fundamental and innovative sciences, which are essential to building knowledge-based societies.
- The advent of REIs designed to encourage outstanding research by providing large-

scale and long-term funding.

## **B. WPI Centers**

Nine WPI centers were launched during the first 10 years of the WPI Program.

The first five WPI centers launched in 2007 are now members of the WPI Academy.

- AIMR on materials science, Tohoku University.
- Kavli IPMU on the universe, The University of Tokyo.
- **iCeMS** on cell biology, Kyoto University
- IFReC on immunology, Osaka University
- MANA on nanotechnology, National Institute for Materials Science

The sixth WPI center was launched under the "green innovation program" in 2010.

- I<sup>2</sup>CNER on energy, Kyushu University

Three WPI centers were launched under the new "WPI Focus" program in focused research areas in 2012.

- **IIIS** on sleep, University of Tsukuba
- **ELSI** on Earth-life, Tokyo Institute of Technology
- **ITbM** on bio-molecules, Nagoya University

In 2017, the 11<sup>th</sup> year of the WPI Program, two WPI centers were added:

- **IRCN** on neurointelligence, The University of Tokyo
- NanoLSI on nano-probe life science, Kanazawa University

In 2018, the 12<sup>th</sup> year of the WPI Program, two more centers were launched:

- ICReDD on chemical reaction design and discovery, Hokkaido University
- **ASHBi** on human biology, Kyoto University



Figure: WPI centers in FY 2019

As shown above, the 13 WPI centers cover four science areas: Origins of the Universe, Earth, Life, and Intelligence; Life Science; Materials/Energy Science; and Mathematics/ Information/ Data Science.

## C. Follow-up framework

The WPI Program carries out a robust follow-up system comprising the international Program Committee, program director (PD), deputy program director (DPD), program officers (POs), and working groups (WGs). Since 2017, an academy director (AD), academy officers (AOs), and Academy working groups (AWGs) have been put in place to oversee the follow-up activities of the WPI centers that are members of the WPI Academy.

## **Program Committee**

The Committee membership changed in FY 2019: Dr. Toshiaki IKOMA resigned. All the Committee members and their affiliations are listed in the following website: <u>https://www.jsps.go.jp/english/e-toplevel/data/07\_committee/PC\_member\_list.html</u>



The FY 2019 Program Committee meeting was held on 13-14 November in Tokyo. Of its 16 members, 13 participated. The main items of business on the agenda were (1) the final evaluation of I<sup>2</sup>CNER in its 10<sup>th</sup> year, the extension application screening

Figure: FY 2019 WPI Program Committee at Gakushi-kaikan

of IIIS, ELSI, and ITbM in their 8<sup>th</sup> year, progress evaluations of the five WPI centers that are receiving ongoing funding, which were carried out based on presentations by the presidents of their host institutions and center directors as well as on site-visit reports and the centers' own progress reports, (2) annual report of WPI Academy and its centers, and (3) the future of the WPI Program.

#### PD, DPD, POs and WGs

- PD: Dr. Akira UKAWA has been serving as Program Director since April 2017.
- DPD: Dr. Minoru YOSHIDA was appointed Deputy Program Director in December 2017.
- POs: Experts in the research areas of each center. They chair site visits and prepare site-visit reports by compiling the comments of the site-visit team members.
- WGs: Assembled for each WPI center, these groups principally consist of 3 domestic and 3 international experts in areas that cover the center's activities.

PD, DPD, POs and WG members and their affiliations are listed in the following website: <u>http://www.jsps.go.jp/english/e-toplevel/08\_followup.html</u>

#### AD, AOs and AWGs

- AD: Dr. Toshio KUROKI has been serving as Academy Director since April 2017.
- AOs: Experts in the research area of the member centers. They chair site visits and prepare site-visit reports for the Program Committee.
- AWGs: Assembled for each WPI center, these groups principally consist of 2 domestic and 1 international expert in areas that cover the center's activities. AWG members will be

appointed at a later date.

AD and AOs and their affiliations are listed in the following website: <u>https://www.jsps.go.jp/english/e-toplevel/18\_academy.html</u>

#### Site Visits

Site visits to the WPI centers receiving ongoing funding were conducted during the period of June-September 2019.

A full 2-day site visit was carried out on nine centers, Kavli IPMU in its 13<sup>th</sup> year, I<sup>2</sup>CNER in its 10<sup>th</sup> year, IIIS, ELSI and ITbM in their 8<sup>th</sup> year, IRCN and NanoLSI in their 3<sup>rd</sup> year and ICReDD and ASHBi in their 2<sup>nd</sup> year. The members of the site-visit team were the PD, DPD, PO, WG, MEXT officials, and JSPS secretariat. The AD participated as an observer. Interested Program Committee members also participated. The visit schedule included briefings by the president of the host institution and center director and presentations by selected PIs. Poster presentations by young researchers spawned a free discussion between them and site-visit team members.

For all 9 centers, reports of the site visits were submitted to the Program Committee and disclosed to the respective centers.

#### WPI Academy Site Visit

For the four Academy-member centers (AIMR, iCeMS, IFReC and MANA), half-day visits were made by the AD and AOs between December 2018 and January 2019. The PD and DPD participated as observers. The center directors reported on progress made in FY 2017, the first year of their activity as WPI Academy centers, and also on activities for accelerating international brain circulation, with comments provided by (vice) presidents of the host institutions. These were followed by discussions between them and the visiting team. Full site visit with AD, AO, and AWG with PD and DPD, to be held once every three to four years, is scheduled in FY 2020.

## D. Final evaluation on the center launched in 2010 (I<sup>2</sup>CNER)

FY 2019 marks the 10th year of funding for I<sup>2</sup>CNER, launched in FY 2010. Its final evaluation was therefore conducted by the Program Committee at its meeting held in November.

The Committee members were all impressed by the high level of science being advanced at I<sup>2</sup>CNER as it takes on multifaceted challenges to develop the foundations of a carbon-neutral society. The Committee also found that I<sup>2</sup>CNER has successfully executed the mission of the

WPI Program in terms of feeding its research results back into society, advancing interdisciplinary research, and promoting internationalization and system reform within the university. The Committee fully confirmed its previous evaluation in 2017 that I<sup>2</sup>CNER has achieved the "world premier" status, satisfying the goal of the WPI program. The comments from the Program Committee and Working Group are summarized below.

#### Center Director: Petros SOFRONIS

Program officer: Kazunari DOMEN, Shinshu University & The University of Tokyo

#### 1. Identity of the center

I<sup>2</sup>CNER has established itself as a globally unique institute for energy research towards establishing a carbon-neutral society. The high visibility of I<sup>2</sup>CNER is evident within the global network of excellence connecting I<sup>2</sup>CNER with many institutions worldwide. The international composition of its research staff is another manifestation of I<sup>2</sup>CNER's global awareness.

#### 2. Scientific achievements

The research activities conducted by I<sup>2</sup>CNER are doubtlessly world-class, with scientific issues being addressed in such a way as to exert a vital impact on society. The large amount of external funding that I<sup>2</sup>CNER has secured and its high number of excellent journal papers and awarded patents provide good evidence for the quality of the research being conducted in the I<sup>2</sup>CNER program.

#### 3. Feeding research outcomes back into society

I<sup>2</sup>CNER has carried out 122 collaborative projects with industry, and 53 projects have resulted in technology transfers, which is an appreciable number. Since its inception, I<sup>2</sup>CNER has filed for 239 patents and has been granted 67 patents, which is also impressive.

#### 4. Implementation as a WPI Center

**Interdisciplinary research**: The disparate nature of the disciplines involved in I<sup>2</sup>CNER research facilitate interdisciplinary work through collaborations across division boundaries. In particular, the interdisciplinary research direction referred to as "Applied Math and Economics for Energy" is regarded as an important component of I<sup>2</sup>CNER.

**Internationalization:** I<sup>2</sup>CNER is now a truly global institution, with more than 40% of its PIs (11 out of 26) and researchers coming from abroad, and its percentage of non-Japanese graduate students is more than 60%. I<sup>2</sup>CNER's researchers are globally engaged

and responsible for organizing and co-organizing more than 200 international conferences. I<sup>2</sup>CNER has produced joint publications with researchers from more than 500 institutions around the world.



Figure: Kyushu University and the University of Illinois at Urbana-Champaign (Illinois) renewed their academic exchange agreement and established a new strategic partnership.

## System reforms:

I<sup>2</sup>CNER has spearheaded a series of reforms at Kyushu University. It has now established itself as an independent entity within Kyushu University with many benefits, such as topdown management, vigorous evaluation,

merit-based salaries and an international, interdisciplinary approach to research. This in turn has created a significant and beneficial ripple effect across the entirety of Kyushu University.

#### 5. Efforts toward sustainability

The creation of the Kyushu University Platform of Inter/Transdisciplinary Energy Research (Q-PIT) initiative is very encouraging. Kyushu University is expected to remain highly committed to I<sup>2</sup>CNER in terms of providing space along with financial and personnel support as part of its thrust to become one of the world's top 100 universities.

#### 6. Progress plan after WPI funding ends

New scientific challenges and directions for the next phase of I<sup>2</sup>CNER should be identified and spelled out in detail. It will be important for I<sup>2</sup>CNER to identify the focus of the research areas where it can identify and differentiate its standpoints. In this regard, Q-PIT is a suitable structure for sustaining this effort. It is also proposed that the organization be changed from nine thematic divisions to three thematic research clusters and two platforms. A clear commitment for comprehensive support in terms of personnel, space, equipment, project funding, etc., was promised by President KUBO of Kyushu University.

# E. Extension application screening on the 3 centers launched in 2012 (IIIS, ELSI, ITbM)

The three centers, IIIS, ELSI, ITbM, launched in FY 2012 applied for 5-year extension of funding. The Program Committee conducted extension application screening of the three centers in its annual meeting in November 2019.

In evaluating the state of WPI center establishment, the Committee took as a principle that, to assure the quality of the WPI Program and to secure its credibility, the standard of "world premier" status must be set very high, and that each center must be strictly evaluated to determine whether or not it has achieved that high standard.

The Committee members were all impressed by the high level of science being advanced at each of the three centers. The Committee also found that the three centers have successfully executed the WPI Program's missions of advancing interdisciplinary research and promoting internationalization and system reform within the university. The Committee unanimously agreed for each of the three centers that it has achieved the "world premier" status in ways that fully meet the goal of the WPI Program.

A 5-year extension is possible only for centers with exceptionally "outstanding" results. The Committee discussed extensively the definition and implications of this "outstanding" status in its 2014 meeting and adopted the following principle: The "outstanding" results that merit a 5-year extension are only applicable to exceptional cases that have demonstrated superlative achievements far beyond the very high standard of the "world premier" status.

In accordance with the above principle, the Committee decided that only truly superlative cases of achievement that garner the support of a large majority of the Committee members can be considered for an extension beyond the 10-year term. The three centers were not selected for extension, although the performance is highly evaluated as having fully achieved the "world premier" status, satisfying the high standard of the WPI Program.

## F. Future plan of the WPI Program

At the Program Committee's November meeting, MEXT presented a mid- to long-term plan for the WPI program. The Committee offered comments and advice regarding it, and made the following requests in writing after the meeting:

Over the recent years, the WPI Program has played a highly significant role in advancing the internationalization and elevating the performance of Japan's research environment. Considering the remarkable contributions made by the Program in the last decade and its excellent capacity to produce valuable outcomes, the Program Committee herein requests MEXT to institute measures needed to further strengthen the Program's standing and importance within Japan's national policy on science, technology and innovation. Specifically, the Committee makes the following requests:

- (1) At the Program Committee's Meeting on 13th November 2019, Mr. Murata, Director-General of Research Promotion Bureau at MEXT, presented the plan for the next decades of the WPI Program. Together with the suggestions and requests made by the Committee members at that time, we would like to have continued dialogue and cooperation with MEXT on those issues relating to the future of the WPI Program, including its "new missions," with close communication between the Committee members and the program stakeholders in and out the government.
- (2) Given the new missions of the WPI Program appropriately formulated by MEXT, we believe that a certain number of new WPI Centers should be selected every several years so that potential center candidates can foresee and prepare in advance. We also believe that continuous and smooth transition toward the new phase of the Program is imperative for its sustainable development.
- (3) We would insist that it is essential to exploit the full potential of the WPI Centers whose funding period ended, called the WPI Academy Centers, as valuable "assets" in advancing Japan's research environment and the national policy on science, technology and innovation. Therefore, we would request a support system to strengthen the function and capability of the WPI Centers including the Academy Centers, which would contribute to the formulation of the global network of interdisciplinary basic research centers with the world's highest standard.

In sum, we would like to request MEXT strong and sustained support for the WP! Program, including the implementation of timely policy measures and solid budget planning, thereby enabling the program to continue to make unique contributions to further developing and promoting Japan's research environment.

## G. Follow up on Kavli IPMU, Launched in 2007

Center director: Hirosi OOGURI Program officer: Ichiro SANDA, Nagoya University

## 1. Scientific achievements

The Program Committee (PC) congratulates Kavli IPMU on its impressive performance in achieving world-class science goals. Kavli IPMU's activities are going well as seen in terms of its paper citations and the progresses of its experiments that have been launched at the beginning of Kavli IPMU. Kavli IPMU's new leadership has brought new energy, openness, and changes to the center. Openness includes its clearly stating that some single PI projects will not be getting new faculty appointments. Changes include forming a Long-term Strategic Planning Committee to review all of Kavli IPMU projects and reduce its hierarchy – foretelling a bright future in terms of evolution and strategy in achieving further success in world-class science.

#### 2. Implementation as WPI center

It is the PC's sincere hope that the efforts made by Kavli IPMU and the University of Tokyo (UTokyo) towards implementing reforms will lead to a complete reform of the way research is being conducted in Japan. While some important reforms have been accomplished by UTokyo, further major reforms are needed. For example, removing the barriers between the departments and UTokyo management as well as UTokyo institutions. The value of setting up WPI at UTokyo will be judged by UTokyo's reforms that lead to achieving the WPI goal.

**Interdisciplinary research:** The transfer of  $\gamma$ -ray imaging techniques to Life Science applications is fascinating, and it reiterates the fact that fundamental science can lead to unplanned real-world applications. This also enhances society's support for Kavli IPMU.

**Internationalization:** The most impressive achievement of Kavli IPMU is the internationalization of its team. Fifty percent of the full-time scientists are non-Japanese.



Many Kavli IPMU foreign postdocs have acquired tenure-track faculty appointments, some at Japanese institutions. Three Oxford University students received PhDs through Kavli IPMU research.

Figure: Weekly Women's Lunch initiated by Yukari Ito, Professor in Mathematics. Women researchers working hard among males can relax and refresh by chatting here.

**System reforms:** The commitment by Director OOGURI to diversity is highly commendable, but it still has a long way to go and a significant long-term commitment is needed.

## 3. Efforts toward sustainability

Efforts by UTokyo in support of Kavli IPMU should be commended. Its funding comes from UTokyo, MEXT, as well as Kavli Foundation. At present, however, a funding level appropriate for WPI has not been achieved. PC hopes that this issue will be solved soon.

### 4. Actions required and recommendations

- Kavli IPMU needs to develop ways to systematically encourage out-of-the-box thinking, which may lead to breakthroughs.
- (2) Planning seems to be one-way from senior to junior researchers. The Director should consider appointing one or two outstanding young researchers to the Long-term Strategic Planning Committee.
- (3) More effort by Kavli IPMU is needed to achieve better diversity, especially in the gender area.

# H. Follow up on the 3 Centers Launched in 2012

## H-1. IIIS

Center director: Masashi YANAGISAWA

Program officer: Kozo KAIBUCHI, Nagoya University

## 1. Scientific achievements

IIIS has produced top-level science on many aspects of sleep. Director YANAGISAWA has together with Dr. FUNATO carried out forward genetics on a mouse sleep phenotype. This is top world-level research. Dr. T. SAKURAI's new finding on hibernation by Q neurons is exciting and will be another of IIIS's groundbreaking findings. Dr. HAYASHI has succeeded in genetic manipulation of the REM/non-REM sleep switch in mice. Dr. NAGASE continues to develop chemical compounds that have potential for seeds.



Figure: Researchers at IIIS found the specific proteins localized on synapses whose phosphorylation status changes depending on the degree of sleep need, taking a step closer to elucidating the molecular basis of sleepiness.

#### 2. Implementation as a WPI center

**Interdisciplinary research:** IIIS has done an excellent job at catalyzing the fusion of fields including chemistry, genetics, neurophysiology, and basic sleep analysis. As an outstanding outcome derived from its fusion studies, Dr. NAGASE and his colleagues have developed new orexin agonists for hypersomnia including narcolepsy. IIIS has developed unique

technologies such as a mobile sleep lab based on Toyota's fuel cell bus. Their wearable EEG device for home sleep monitoring has added novel disciplines to be fused into sleep science.

**Internationalization:** IIIS's researchers are 1/3 from abroad in both the case of PIs and other researchers. There are also a significant number of students who visit IIIS from abroad through the University of Tsukuba's TSSP program. The center's well-staffed administration is English-based with 70% of its personnel proficient in English. There has been a constant flow of visitors to the WPI-IIIS seminar series and to the annual WPI-IIIS symposia. Together with its state-of-the-art facilities and equipment, IIIS has successfully developed a very international research environment.

**System reforms:** The director has successfully created a U.S.-style institute, which has a very attractive atmosphere. The center provides its researchers with a physically and psychologically open environment. IIIS exposes its researchers and staffs to a naturally international environment. Activities for public outreach and media coverage are carried out extremely well at IIIS. It would be ideal if IIIS's experiences could be adopted within the university in the future.

#### 3. Actions required and recommendations

- (1) While IIIS has produced several outstanding results, it appears that it has not fully exploited the potential that these results provide for the further understanding of sleep. The role that Sik3 plays in controlling sleep is an important example.
- (2) Remarkable achievements by IIIS provide unique, novel targets for drug discovery, such as Sik3 inhibitors or activators and agonists or antagonists for Q neurons. It is time for IIIS to start conducting assay development and high throughput screening.
- (3) It would be desirable to have an additional program in systems biology or theoretical neuroscience. This would help IIIS address fundamental questions in the organization of the neuronal/molecular systems associated with sleep regulation.
- (4) Although IIIS is indeed different and has created a novel research structure, it remains to be seen whether IIIS has broadly reformed the university.
- (5) The director serves as the CEO of the venture S'UIMIN Inc. His role may pose a conflict of interest and of commitment, so will need to be monitored.

## H-2. ELSI

Center director: Kei HIROSE Program officer: Shoken MIYAMA, Hiroshima University

#### 1. Scientific achievements

Exciting results have been obtained on the formation of planets and their surface environment coupled with giant impacts and magma oceans. ELSI has also made great progress in the understanding of prebiotic chemistry. Its recent developments in messy chemistry are original and have established high research standards. The formation of CO and NH<sub>4</sub> caused by geo-electro-chemistry occurring around hydrothermal vents is truly interesting, as is the production of the RNA precursor from cyanide.

## 2. Implementation as a WPI center

**Interdisciplinary research:** Deep Earth studies have led to the integrated science program "Co-evolution of the core and mantle," and interest in the origin of life and planetary habitability led naturally to "Aqua-planetology." Similarly, its "Hadean bioscience" initiative links biology, chemistry and planetary sciences in a highly interdisciplinary (fused) way.

**Internationalization:** With its high percentage of foreign researchers (about 50%), ELSI is a truly international institute. Moreover, the flux of foreign visitors who come as visiting



Figure: Group Discussion, 7th ELSI Symposium.

scientists and lecturers has widened the perspectives for Japanese students and young scholars, creating an international research environment in which they feel welcomed.

System reform: Dr. VOYTEK, the executive director, is planning to introduce a new

managing system for constructing a global standard system for ELSI and Tokyo Tech.

## 3. Actions required and recommendations.

- (1) There are a number of research themes continuing under the original roadmap. Making clear what constitutes the successful conclusion of research and what has actually been achieved will be very important for claiming that the ELSI research on the origin of Life within the context of the origin of Earth has reached a successful stage.
- (2) More concrete strategies are thought to be necessary for universal biology projects in future plans.
- (3) Tokyo Tech should be encouraged to hasten its support for the involvement of ELSI PIs in the university's systems, including the supervision of graduate students as well as lectures in both graduate and undergraduate classes.

## H-3. ITbM

Center director: Kenichiro ITAMI Program officer: Itaru HAMACHI, Kyoto University

## 1. Scientific achievements

ITbM continues to make impressive progress and has made enormous scientific achievements. This is clearly indicated not only by the number and quality of publications in high-impact-factor journals at very high level, but also by the excellent record of competitive



Figure: ITbM discovered a series of molecules that control plant reproduction

research funds granted to ITbM's research members. In terms of the core ITbM projects, the tackling of the parasitic plant Striga has progressed to a field study in Kenya to test the efficacy of super-strigolactone (SPL7), recently developed by ITbM in addition to further advance made in related basic research. ITbM has also discovered many unique synthetic molecules, which are potential candidates for its next flagship projects, such as structurally unique nanocarbons, stomata controlling molecules, and drug candidates for jet lag. Most of them are made from ITbM's rich and original compound library, and fundamental research using such key molecules is now under way.

#### 2. Implementation as a WPI center

**Interdisciplinary research:** ITbM's strategy of mix-lab/mix-office has worked exceptionally well in fusing (synthetic organic) chemistry and plant/chrono-biology together with structural and computational research. The number of joint papers and patents produced by collaboration among ITbM PIs has greatly increased. ITbM is now widely recognized as a global leader in research in chemistry-inspired innovative biology.

**Internationalization:** Of the 13 PIs at ITbM, 5 are from abroad (38%) and 33% of its researchers (25/76) are also from abroad. ITbM successfully organized the first EMBO workshop in Japan with experimental courses.

**System Reform:** According to President MATSUO's Initiatives for Reform, Autonomy and Innovation 2020 (NU MIRAI 2020), ITbM will be positioned as a core research center within the Institutes of Advanced Research Excellence of Nagoya University (NU), where ITbM is expected to be a role model in facilitating the reform of the entire university. In addition, NU has successfully applied for the MEXT Doctral Program for World-leading Innovative & Smart Education (WISE Program) placing ITbM at the core of its Graduate Program of Transformative Chem-Bio Research (GTR).

#### 3. Actions required and recommendations

(1) ITbM should start to communicate with researchers/institutes in the field of "precision agriculture," which is being actively pursued in Europe and the US. Use of ITbM's unique chemical library in a variety of research objectives should be important in pursuing its future direction. For instance, it may allow for the discovery of molecules that increase root biomass to capture carbon from the air, which will lead to an effective way of sequestering carbon dioxide through agriculture. (2) NU and ITbM should continue to cooperate in sustaining ITbM within the NU structure in both research and education. In order to nurture the young generation within ITbM's interdisciplinary atmosphre, it is recommended that a new education program be carefully designed based on the recently approved GTR in the WISE Program.

## I. Follow up on the 2 Centers Launched in 2017

### I-1. IRCN

Center director: Takao HENSCH Program officer: Masayoshi MISHINA, Ritsumeikan University

#### 1. Scientific achievements

By understanding the brain from a bottom-up approach, IRCN aims to elucidate the foundations of human intelligence at a deeper level. The three pillars of the center's research are establishing bottom-up principles of neural development, innovating brain-based artificial intelligence, and unraveling mechanisms of neurodevelopmental and psychiatric disorders. The research of the individual members is of high quality in all four relevant areas – brain development, computation, clinical and technology. The Center's research is published in the highly competitive peer-reviewed international journals. With emphasis on team-based collaborative science, many cross-field talks and collaborations are emerging among disciplines. However, dual feedback between neuroscientists and computational scientists still needs to be developed.

#### 2. Implementation as a WPI center

**Interdisciplinary research:** IRCN has made significant progress in creating a single integrated program through strong and compelling attempts undertaken by all the faculty to achieve a common vision. The core facilities are state-of-the-art and are providing essential services to all members. They hold a joint seminar (science salon) and are working to consolidate the whole faculty into one site within the University of Tokyo (UTokyo). Our concern is the apparent lack of a clear scientific strategy on how to incorporate findings from the neurodevelopmental unit into the computation unit to build neuro-inspired artificial intelligence.

**Internationalization:** IRCN has an international Director and Executive Director. The environment is welcoming to non-Japanese researchers, with wide-spread English. Establishment of the IRCN satellite at the Boston Children's Hospital and the student



exchange program with Harvard University have contributed to IRCN's globalization. IRCN has established new partnerships with globally prestigious institutions by concluding MOUs with them. Particularly commendable are the 'scientific communication'

Figure: First IRCN Neuro-Inspired Computation Course for international exchange of ideas at the boundary between computational science and neuroscience

course, the exchange program sending UTokyo students to Harvard, and the "Neuro-Inspired Computation" course. However, the ratio of foreign PIs is still low. Further efforts should be made to hire more researchers from abroad, especially PIs.

**System reforms:** The hiring of Charles YOKOYAMA as an executive director to head the office of "Research Strategy" and to offer courses on critical scientific speaking and writing skills is an outstanding development, as is the 'ecosystem' concept. The newly hired PIs are 100% IRCN concentrated, but the majority of initial lineup of PIs are still primarily affiliated with their home departments and have many primary obligations. UTokyo should make every effort to mitigate this situation of IRCN. We encourage IRCN to empower junior investigators to conduct independent research without supervision of senior colleagues. The interaction between IRCN and Kavli IPMU should be strengthened.

**Effort to secure the center's future development:** UTokyo provided generous support to build up IRCN, including funding for some of its basic instruments and space. With the expansion of the faculty, however, there appears to be a need for more space to put all IRCN researchers under one roof. UTokyo should make effort to provide more space for IRCN (e.g. new building, more space with reduced space charge). Another important issue for the sustainability of IRCN is the securing of PI positions. A systematic effort is needed on the part of UTokyo to secure funding and positions for IRCN. Given the large contemporary corporate efforts in AI within the technology industry in the US, China and Japan, it should

not be all that difficult to attract industrial funding to help support IRCN's mission.

#### 3. Actions required and recommendations

- (1) IRCN is still in the constructon phase. The physical presence of Director HENSCH at UTokyo should build up to the level requested by the Program Committee.
- (2) IRCN should develop a clear scientific strategy on how to incorporate findings from the neurodevelopmental unit into the computation unit to build neuro-inspired artificial intelligence. IRCN's long-term roadmap describing the Center's targets and milestones over the lifespan of the Center should be polished and explained at the next year's site visit.
- (3) Next year, IRCN will need to focus on three topics: (i) long-term sustainability, (ii) further integration of individual research efforts, and (iii) establishing a stronger internal "esprit de corps" among IRCN researchers, staff and faculty, a sense of unique mission and brand. Carrying out these efforts will be challenging given the traditional department structure of the host university but will be essential in helping to establish an exciting new field and in makig further scientific discoveries in areas of health and disease.
- (4) UTokyo should work more proactively toward realizing an "under one roof" environment at IRCN and systematically providing positions to IRCN so that all the PIs can concentrate on their work at the Center. This will also be very important for the sustainability of IRCN beyond the WPI funding.
- (5) The involvement of young students is essential for the development of IRCN. IRCN should develop its own PhD program.
- (6) The researcher lineup is now more balanced across the neural development, computation, and clinical aspects. It would be advisable to have one deputy director from computation side since the fusion of neuro and mathematical science is a very important mission of IRCN.

#### I-2. NanoLSI

Center director: Takeshi FUKUMA Program officer: Akihiko NAKANO, RIKEN

## 1. Scientific achievements

NanoLSI is making good progress in science with exciting new results. Fabrication of long



Figure: High-speed AFM revealed accelerated binding of agitoxin-2 to a K+ channel: Representative AFM images of potassium channel KcsA (Q58A/T61S/R64D) with (right) or without (left) AgTx2. Height profiles along white dotted lines are shown. Bar, 2 nm.

(Sumino et al, Science Advances 5(7): eaax0495, 2019)

and thin nanoprobes for 3D-AFM has enabled their penetration into living cells without lethal damage for the first time. The scanning rate of high-speed AFM has been made even faster. The great advantage of BioSPM is its high speed, high resolution and capability to explore force measurements. In that sense, their structural analysis of intrinsically disordered proteins and their work on exosomes to characterize the protein's stiffness are impressive. Efforts to devise useful sensors for nanoendoscopy, computational simulation, and

BioSPM approaches to cancer-related molecules have also led to interesting results.

#### 2. Implementation as a WPI center

**Interdisciplinary research:** NanoLSI has been working hard to realize fusion between different disciplines. To achieve further fusions, however, a strong strategy and leadership will be required. Not only validation of potential models obtained by other methods, creation by BioSPM of wholly novel perspectives in life science is hoped for. To exchange ideas among research with different expertise, interdisciplinary meetings should be held more frequently, and spontaneous interactions among young researchers should be enhanced.

**Internationalization:** NanoLSI has five foreign PIs and has recruited one foreign Junior PI. However, their activities at NanoLSI were not clearly presented at the site visit. PIs from abroad are expected to dedicate a certain amount of effort at the institute, but this does not seem to be fulfilled. The concluding of formalized MOUs with the two overseas satellites, the Imperial College London and the University of British Columbia, was a good start. The activities and nature of these satellites should be described in more detail next time.

System reform: NanoLSI has made great progress in organizational reforms. Kanazawa

University provides strong support for its research and for the construction of the new building. NanoLSI is already defined as an independent department within the university and is planning to set up a graduate course, "Division of Nano Life Science," for master's and doctorate students. The six positions kept for tenure-track researchers at present are secured for the future by the university president.

**Effort to secure the center's future development:** Kanazawa University is making very strong efforts to develop NanoLSI over the mid- to long-term. The success of getting funding for a new building, which will be completed next year, is very beneficial and the establishment of a new graduate school department is the first important step to secure the institute's future. It is significant that the six positions kept for tenure-track researchers at present are secured for the future by the university president.

#### 3. Actions required and recommendations.

The serious consideration given by NanoLSI toward the recommendations made last year is highly commended. To improve its activities further, the following is recommended.

- (1) Define the activities of the foreign PIs at NanoLSI more explicitly.
- (2) Improve the gender balance.
- (3) Hold meetings more often. What is important here is to provide an environment where people, young researchers in particular, meet naturally and automatically.
- (4) Consider in a realistic way a goal-oriented strategy for fusion between BioSPM and supramolecular chemistry.
- (5) As for the formation of a new graduate course, care should be taken to secure more autonomous and fusion science than in old departments.

#### J. Follow up on the 2 Centers Launched in 2018

## J-1. ICReDD

Center director: Satoshi MAEDA Program officer: Kazuyuki TATSUMI, Nagoya University

#### 1. Scientific achievements

While ICReDD has existed for barely a year and is still in the set-up phase, the significance of its AFIR (Artificial Force Induced Reaction) method has been recognized at the global level.

The potential impact of this theoretical tool in "design and discovery of new chemical reactions" will be very high, and the center has assembled a strong team of scientists to advance its research.

The original premise was that ICReDD would revolutionize chemical synthesis through design and planning, and that this would be a widely long-term goal. However, AFIR's target reactions are at present limited mostly to textbook reactions, and to too many independent topics without common focus.

The Program Committee senses that the center needs to identify "Grand Challenging Subjects" with relevance to ICReDD's mission, particularly in the area of basic research. There are some encouraging developments, e.g. some very exciting results achieved using the reaction catalog generation system and an attempt to tackle the challenge of decomposing solid plastics.

## 2. Implementation as a WPI center

**Interdisciplinary research:** ICReDD's overall vision of using a combination of theoretical, informational and experimental methods is attractive in terms of finding new chemical reactions that could replace or supplement the often-used "trial and error" strategy for chemical synthesis. Therefore, ICReDD provides a great opportunity to combine these areas toward realizing or even to exceeding the vision articulated in the research proposal in its application.



At present, the Program Committee observes that the center has only small groupings,

typically combining two disciplines, usually led by experiments with collaborating theory in a conventional fashion. To ensure that the institute is capable of working at the highest level, there needs to be

Figure: Interdisciplinary discussion among young researchers in the Mix-Lab

consideration given to long-term and strategically important goals toward which all the participants of the three different areas can potentially contribute.

To achieve this, ICReDD will need to articulate the center's core values and goals both internally and also internationally so as to establish a strong presence within the research community. This is a leadership issue and should be addressed as such. If ICReDD is aiming to create a paradigm shift in chemical synthesis design, it will need to exert an impact by generating surprising and transformational ideas; a multidisciplinary approach should facilitate the generation of new solutions and identify new problems that have not yet been recognized.

**Internationalization:** ICReDD has a major goal of internationalizing research collaborations. This implies that major efforts are to be made in encouraging more visits and particularly longer-term interactions across a range of countries and disciplines. However, internationalization of the institute has not been satisfactorily addressed apart from the improvement seen in the reported number of foreign researchers.

The presence of international researchers will not automatically assure ICReDD becoming an international research hub. More efforts at advancing internationalization will be necessary. For example, the center should make better connections with major international data analytics institutes/firms.

There was an expectation that an international atmosphere would develop around the institute through close cooperation. However the presence of foreign researchers was not apparent at that moment. One could speculate on the reasons for this, e.g. a lack of coordination among diverse groups across ICReDD's laboratory space, which coordination should be a priority in designing interactions between groups in the new building.

Aside from this, there are improvements that need to be made to make the center more visible internationally. In doing so, the center will need to create a strong international 'brand' that shows ICReDD to be a leading institute in its area.

**System reforms:** The overall plan and implementation of an efficient management structure for ICReDD's organization is not sufficient. The Program Committee observes ICReDD's director to be an excellent scientist but for him to function effectively as the director he must be sufficiently supported by a strong administrative/scientific team in ICReDD. Establishing an advisory committee, including foreign members, is also advised.

"MANABIYA" is a very important component of ICReDD both in terms of making the institute more international and in promoting collaborative research between theory and experiment. Unfortunately, it is still not clear how the MANABIYA system is operating, how in the future it will be linked to the graduate school system of Hokkaido University (HU), and how the system will be expanded to develop new schemes for collaborations. The MANABIYA Unit in the administrative office has so far not really been set up, so the realization of MANABIYA's potential has yet to be seen.

**Effort to secure the center's future development:** HU is providing support in terms of space/building, positions, and funding. However, HU needs to devise and deliver a clear plan on how to make ICReDD a permanent institution within the university. In particular, it's urgent that HU expand the currently limited space allocated to ICReDD. It is even more urgent that HU work with MEXT in designing and constructing a new building next to the CRIS building for use by ICReDD.

#### 3. Actions required and recommendations

- (1) The Program Committee urges ICReDD to establish a strong administrative/scientific team to support the director. Setting up of an advisory board is also recommended.
- (2) The center does not have competence in information science sufficient for the area to be fully integrated into the center. This problem should be solved promptly. The gender issue should also be addressed for the activity of ICReDD.
- (3) ICReDD's vision and mission should be appropriately shared by all the center's members.
- (4) To realize the scientific goal(s) set by ICReDD, concrete and specific scientific targets should be promptly set. At the same time, challenging, long-term targets of high significance should be set, targets that could revolutionize current scientific concepts.
- (5) Attention needs to be directed on identifying joint projects that achieve defined strategic objectives and on how working together and integrating skills across ICReDD can best be achieved.
- (6) There are a handful of good examples of international networking carried out on an individual basis among the PIs. The scope of these individual networkings should be expanded to an institutional level.
- (7) Plan to publish booklet(s) and periodical(s). It is also suggested that an immediate effort

be made to correct any broken links and to urgently improve ICReDD's current website.

(8) It is urgent that additional lab space is secured, to do which the construction of a newbuilding is the key. HU should, as quickly as possible, take aggressive action to provide ICReDD with an expanded working environment.

#### J-2. ASHBi

Center director: Mitinori SAITOU Program officer: Hideyuki OKANO, Keio University

#### 1. Scientific achievements

With its ambitious program on human biology, ASHBi has made a good start under the leadership of an outstanding scientist, Dr. Mitinori SAITOU, and with a strong commitment by the host institution. For its first year, ASHBi appears to be on track and its research has been performed reliably with good results (98 original papers in year one in highly ranked journals). However, being in its starting phase, the center needs to work more on establishing fusion among experimental science and other areas, especially mathematics.

### 2. Implementation as a WPI center

**Interdisciplinary research:** The center has excellent experimental scientists, an outstanding primate facility, and several sophisticated disease models. However, it will be important for it to focus more on interactions among the PIs so as to achieve the center's big vision. To that end, it would be good to add PIs in data science and mathematics. Furthermore, ASHBi needs to provide a stronger explanation as to why it is a fusion project.

Collaboration between data scientists and life scientists is already happening in many universities, especially in using mathematics for genomic and other data analyses. A key opportunity will be the fusing of mathematics with human and primate sciences. A unique opportunity for ASHBi is to have mathematics drive human and primate sciences research in the creation of new ideas or hypotheses. Ethical issues will play an increasing role in the research. Therefore, collaboration between the Bioethics and Philosophy Group with Life Science Groups is very important.

**Internationalization:** ASHBi is gathering together world-class resources, their science has high international visibility, and support from Kyoto University (KU) is excellent. On



the other hand, its internationalization aspects are not fully developed, although progress is under way. The number of international researchers should be increased further. It will also be important to develop more joint

Figure: "Theory of Life in Kitaro Nishida's Philosophy"—a seminar for biologists about the philosophical basis of bioethics.

projects with international collaborators or even through partner institution relationships.

**System reform:** KU has established the KU Institute for Advanced Study (KUIAS) as a hub for centers like ASHBi and iCeMS and to provide a focal point for reforming the entire university. Under the strong leadership of President YAMAGIWA, KU is committed to ASHBi with infra, financial and personnel support. For example, KU provides research space for ASHBi's main research building. The building is at the center of the medical campus, enabling collaboration with researchers from the medical graduate school. Furthermore, the cooperation between KU and Shiga University of Medical Science makes a contribution to system reform. President YAMAGIWA's effort and vision for reforming KU is impressive, especially using KUIAS as a "testbed". He appears to be committed to expanding this model to reform the university.

**Effort to secure the center's future development:** KU has committed its full-fledged support to ASHBi, including providing personnel expenses and covering indirect costs. However, the majority of PIs are jointly appointed and have home departments in KU. This leads to a potential risk in which all PIs with home departments may go back to their original departments after the WPI funding ends. It is necessary for the members to seriously discuss strategies for the sustainability of the institute from a long-term perspective under the leadership of the center director.

#### 3. Actions required and recommendations.

- (1) The ASHBi's vision, direction and goals should be discussed more deeply and with greater clarity, and shared by all PIs and members of ASHBi in order to establish a unique ASHBi identity. Fusion as whole needs to be emphasized.
- (2) Many researchers have been working on a wide range of issues from embryology to clinical issues in mice, monkeys, and humans. However, it should be made clear what clinical problems are being solved.
- (3) ASHBi needs to strengthen its research related to human evolution and human population genetics.
- (4) Collaboration and exchange with clinicians who are seeing patients would be an asset to the center, so that research questions using disease models in animals and cells can be translated into the clinic and benefit patients.
- (5) The center needs to work on its fusion with mathematics more seriously.
- (6) From the aspect of ASHBi's sustainability, moving the primary affiliation of the PIs with home departments in KU to ASHBi should be seriously considered.
- (7) There are 13 PIs at present, of which only 2 are not Japanese. Regarding making organizational reforms and advancing internationalization, more international PIs or co-PIs are needed, as well as collaborations with top international institutions.

## K. WPI Academy

## Aims and members

Concurrent with the end of the 10-year support period for the initially established five WPI centers, a WPI Academy was launched by MEXT in 2017. Its aim is to enhance and amplify the WPI brand and to play a vanguard role in internationalizing and reforming Japan's research environment by leveraging the WPI achievements attained so far. The first five "WPI Academy centers" are AIMR, Kavli IPMU, iCeMS, IFReC, and MANA. They are certified as having reached "world premier" status by the WPI Program Committee. Among them, Kavli IPMU has received extended WPI support for another five years in recognition of its exceptionally outstanding achievements.

#### Financial support to WPI Academy Centers

When they applied for this program, the host institutions promised to sustain their WPI centers after the end of their WPI funding. Even amidst the current financially severe climate, the WPI Academy centers are being sustained by support from their host institutions and by their own efforts to acquire external funding. Their financial support is acquired mainly through the following three sources:

- Host institution: Host institutions support their WPI Academy centers by providing them with more than 500 million yen per year.
- MEXT: MEXT provides two sources of funding for WPI Academy centers: (1) Support for global brain circulation through the JSPS budget, (2) "block budget" requested by host institutions. In total, 100-200 million yen of funding is provided to WPI Academy centers via these sources.
- Effort by the WPI Academy centers: Each WPI Academy center makes considerable effort to obtain supports from multiple sources such as external research funding, collaboration with industries and research organizations, and fundraising through donations from public or private sources. For examples, IFReC was successful in establishing a new type of contract with two pharmaceutical companies that provides funding in excess of its WPI grant. AIMR has started a close collaborative relationship with RIKEN and AIST, which includes personnel support.

Due to support by host institutions, MEXT, and the centers' own efforts, annual funding for WPI Academy centers has been kept at over 1.7 billion yen a year for FY 2018 and FY 2019.

It is the premise of the WPI Program that the WPI centers be self-sustained after the WPI funding ends.

Based on this premise, the WPI academy centers are working proactively toward attaining self-sustainability with their host institution's support and their own independent efforts. While Academy center's PIs are getting younger and the numbers maintained, the number of postdocs has decreased. We expect further effort to be made in these respects.

- Number of researchers decreased by 17% from FY 2016 to FY 2018
  (An average of 137 researchers per center in FY 2018 vis-a-vis 158 in FY 2016)
- Number of PIs did not change

(26.0 per center in FY 2018 vis-a-vis 25.8 in FY 2016)

- Average age of PIs got younger.
  (52.9 years old in FY 2018 vis-à-vis 54.3 in FY 2016)
- Numbers of postdocs decreased by 44%
  (24.0 per center in FY 2018 vis-a-vis 43.5 in FY 2016)

#### Research impact

The research impacts of the five WPI Academy centers were analyzed by MEXT and JSPS in terms of the sum of all the impact factors of the journals in which each paper is published in the said year, which was further compared to five benchmark institutes. Since 2009, two year after the centers' launching, their relative research impact has exceeded the levels of the benchmark institutes, and has maintained the same or higher level after 2017.

## Institute for Advanced Studies

Host institutions have created a new framework for housing the WPI Academy centers within their organizations, which takes a form likened to an "institute for advanced study." These are the "institutes" established in the host institutions for each WPI Academy center

- AIMR: Organization for Advanced Studies (OAS), Tohoku University.
- Kavli IPMU: The University of Tokyo Institutes for Advanced Studies (UTIAS), The University of Tokyo.
- iCeMS: Kyoto University Institute for Advanced Study (KUIAS), Kyoto University.
- IFReC: International Advanced Research Institute (IARI), Osaka University.
- MANA: MANA was incorporated into the National Institute for Materials Science (NIMS) as a center for basic research.

#### Change of WPI Academy centers' directors

A procedure for changing the directors of WPI Academy centers is established as follows:

- 1. The center submits a set of proposal documents to JSPS.
- 2. A pre-evaluation is carried out by AD, AO, PD and DPD.
- A hearing is held by WPI Domestic Committee (consisting of members residing in Japan) from the representative of the host institution, the current center director, and the candidate director.

4. When approved, new director explains his/her center plan to the WPI Program Committee.

Using this procedure, the directors of AIMR and IFReC were changed, as included in the reports below on four Academy centers.

#### Follow up of WPI Academy Centers

The reporting burden placed on the WPI Academy centers has been lightened by changing the follow up procedure. Now, an evaluation of their achievements by working group experts is conducted once every three or four years, while the AD and AO with PD and DPD visit the centers once a year to confirm their achievements. Based on reports by the AD and AO, the WPI Program Committee carries out a follow-up review on the state of the Academy centers' operations. Using the new procedure, half-day visits were conducted on four Academy centers (AIMR, iCeMS, IFReC and MANA) in FY 2017 and 2018. The findings derived from them are as follows.

## AIMR

The mission of AIMR is to create new materials with innovative functions through mathematics-materials science collaboration. Under the leadership of its director Prof. Motoko KOTANI, AIMR has maintained a high level of activity in its three target projects, while publishing many high-quality papers, earning prestigious awards, and receiving a number of competitive funding grants. On October 1, 2019, AIMR installed Prof. Shin-ichi ORIMO as its new center director, who had been AIMR's deputy director and leader of its Device/System Group. He is a specialist in materials science and device fabrication. Following the strategy designed by Prof. KOTANI, Prof. ORIMO will continue to work toward achieving AIMR's ultimate goal of a "predictive new materials science" brought about via collaboration between mathematics and materials science.

#### iCeMS

iCeMS has maintained a high level of scientific activity since 2017 under its theme of "Fundamental Cell-Materials Science." Kyoto University supports iCeMS by providing positions for 9 PIs, 5 oversea researchers, 10 postdocs, and 8 administrators under the framework of the Kyoto University Institute for Advanced Study (KUIAS). Two young executive board members, deputy director, Dr. SUZUKI and PI board chair Dr. FURUKAWA, lead iCeMS's research under Director KITAGAWA. iCeMS collaborates with oversea laboratories in Thailand (VISTEC), France (CNRS), the US (CNSI, Zoological Society of San Diego), India (NCBS, JNCASR, inStem), China (CLS, ShanghaiTech Univ and Shanghai Univ), Taiwan (CYCU), and Switzerland (AO Foundation). In Japan, iCeMS is collaborating with Gifu University (G-CHAIN).

#### IFReC

After 12 years of excellent leadership, Dr. Shizuo AKIRA stepped down from his position as IFReC's director. He is succeeded by Dr. Kiyoshi TAKEDA, who assumed the position on July 1, 2019. Dr. TAKEDA intends to strengthen three of IFReC's projects: (1) Advancing human immunology research, (2) raising the next generation of young scientists, and (3) promoting IFReC's globalization by inviting overseas researchers to the institute, establishing new labs, and implementing various research programs. Toward achieving these initiatives, IFReC is restructuring its operation to include the establishment of a new state-of-the-art Human Immunology Lab, Young Lead Researchers Program, an advanced postdoc system, and a new mentoring system. Upon these new platforms, mutual stimulation between senior and young scientists will work to further invigorate IFReC's activities. Four "advanced postdocs" (two Americans, one Australian, and one Indian) were newly recruited. Drs. M. FUJIMOTO (male) and K. MORO (female) have been appointed as PIs.

#### MANA

Since the end of its WPI grant, MANA has been maintained as an internal organization of NIMS (National Institute of Materials Science), its host institution. As one of NIMS's seven research centers, MANA is responsible for basic research using bottom-up approaches. MANA previously carried out research in five fields but now focuses on three basic fields: Nano-materials, Nano-systems, and Nano-theory. Although its number of postdocs was reduced by 35% after the WPI grant ended, MANA still keeps 219 researchers, of whom 47.5% are from abroad. The center director has changed from Dr. AONO to Dr. SASAKI in 2017.

#### L. Branding and outreach

The WPI Program is promoting the WPI brand through various channels. Social media is a must item, and WPI has an official Facebook account where events from WPI and WPI centers are posted daily.

#### (https://www.facebook.com/wpi.japan)

The WPI's continued participation in the annual conferences of the American Association for the Advancement of Science (AAAS) provides another platform for heightening international visibility of the WPI centers including the WPI Academy centers. Responding to AAAS 2019 annual meeting's theme "Science Transcending Boundaries", WPI exhibit highlighted fusion of disciplines pursued by WPI centers.



In previous years, WPI centers took turns in holding joint symposia, "WPI Science Symposium," oriented to the general public and young generation. This fiscal year's event was held in January 2020 in Tokyo under the title of "The Power of Mathematics: Bridging

Figure: FY 2019 WPI Science Symposium at Yasuda auditorium

Worlds Together," in which more than 600 participated.

Super Science High Schools (SSH), of which 212 are designated as of FY 2019 by MEXT for promoting advanced science education, annually hold a national gathering where high school students from SSH get together and make poster presentations of their researches. Since 2013 WPI has been participating in the annual meeting setting up a booth where SSH students interact with outreach personnel from the WPI centers. This fiscal year the event was held in August 7-8 in Kobe.

The WPI centers have amassed considerable experience and know-how on building international world top level centers and advancing the internationalization of research systems in Japan. Disseminating and sharing these experience and knowhow with universities and research institutions in Japan is an important activity of the WPI Program. "WPI Forum" (https://wpi-forum.jsps.go.jp), an internet portal site, was established in 2018 to share accumulated expertise, beginning with the knowhow on accepting researchers from abroad. This year, its contents are expanded with information on fund raising and research stories from WPI centers, the latter being in collaboration with the BlueBacks science book series by Kodansha Ltd.