



FY 2017 Follow-up of WPI Program

By Program Committee

February 2018

(This document reports on progress made under the WPI Program in FY 2016.)

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In 2007, the Japanese government launched an ambitious initiative to create globally visible and internationally opened research centers. This program, World Premier International Research Center Initiative (abbreviated WPI), successfully concluded its first 10 years of implementation last year. This year marks the beginning of the Program's second decade of operation. This 2017 follow-up report describes important areas of progress achieved in FY 2016 and new developments made in FY 2017, including the launching of the WPI Academy, extension application screening of I²CNER, and the establishment of two new WPI centers, IRCN and NanoLSI.

A. WPI Outline

In 2007, Ministry of Education, Culture, Sports, Science and Technology (MEXT) launched the WPI Program aimed at establishing "World Premium Institutes" that

- Achieve top-notch science
- Cross borders of countries and disciplines and barriers of traditional culture
- Serve as hubs in the global circulation of talented researchers.

Four missions are placed on WPI centers.

- Advancing top-quality science
- Making breakthroughs by advancing interdisciplinary (fused) research
- Achieving internationalization
- Reforming research and administration systems

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 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 in building knowledge-based societies.

- The advent of REIs designed to encourage outstanding research by providing large-scale and long-term funding.

B. Highlights in FY 2017

Launching the WPI Academy

The WPI Academy was launched by MEXT in April of 2017. Its aim is fourfold: (1) To amplify the experience and know-how acquired by the WPI centers which achieved “World Premium Status”; (2) to keep and enhance the profile and brand of the overall WPI Program; (3) to promote the global talent circulation; and (4) internationalize and reform the scientific environment by networking the activities of WPI centers.

Members of WPI Academy are those centers judged qualified to have attained “World

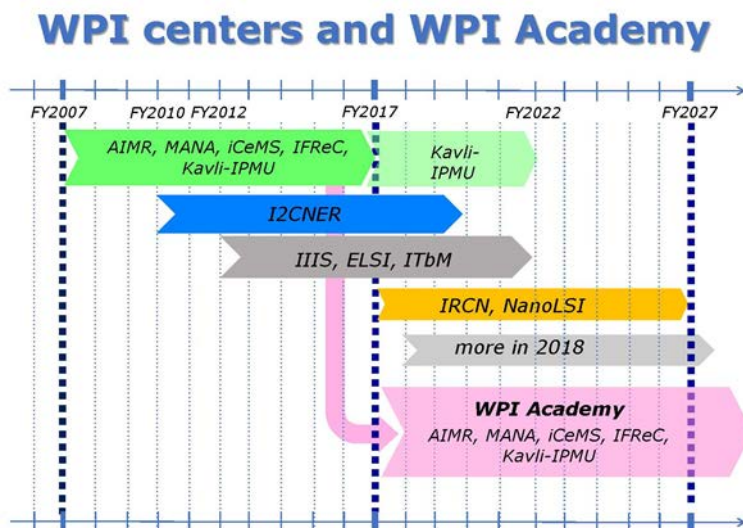


Fig.1 WPI Centers and WPI Academy

Premier Status” and promised to actively participate and collaborate in the activities for promoting the overall WPI Program and amplifying its achievements. This qualification is periodically evaluated by the WPI Program Committee. The initial members of the WPI Academy are AIMR, Kavli IPMU, iCeMS, IFReC, and MANA.

Conducting extension application screening

The funding period for WPI centers is in principle 10 years. For the Centers launched in 2012 or before, it can be extended for five more years if a center’s achievements are particularly outstanding. I²CNER of Kyushu University, launched in 2010, applied for a funding extension, and the screening of its application was conducted by the WPI Program Committee at its annual meeting in September. Though the achievements of I²CNER were evaluated as being very high, they did not garner an extension.

Selecting new centers

Responding to a recommendation made by the Program Committee in 2015 that the WPI Program should proceed forward by calling for new WPI centers, in 2016 MEXT laid out a long-term plan in which two new WPI centers would be launched in FY 2017, and up to a total of 20 centers would possibly be established in the future. Through a rigorous screening process, the Program Committee selected the two new centers at its annual meeting in September 2017. They are the International Research Center for Neurointelligence (IRCN) at the University of Tokyo, and the Nano Life Science Institute (NanoLSI) at Kanazawa University. These centers began their research activities in October.

Foundation of Center for World Premier Research Center Initiative (WPI Program Center)

In the first 10 years, the administrative work for the WPI Program was carried out by the Research Program Division of Japan Society for Promotion of Science (JSPS). With the start of WPI Academy and associated necessity to strengthen administrative function, Center for World Premier Research Center Initiative (WPI Program Center) was founded in JSPS.

C. 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.

- **I²CNER** 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

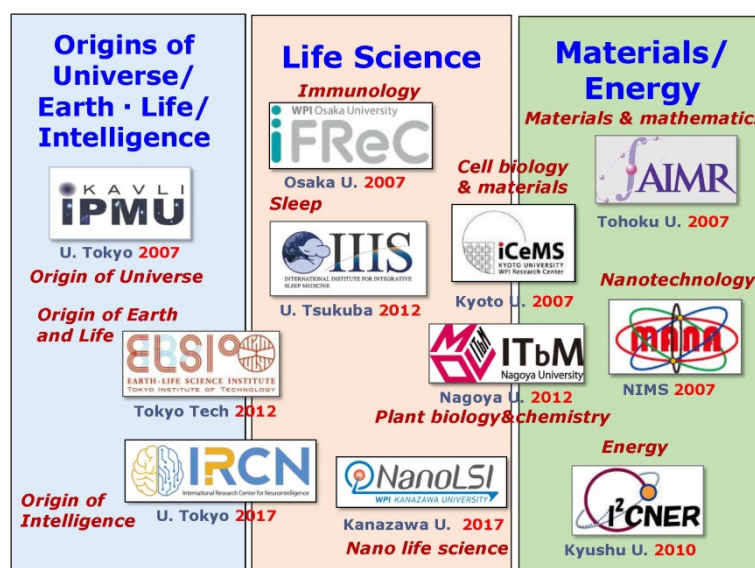


Fig.2 11 WPI Centers

The two new WPI centers added this year are:

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

As seen above, the 11 existing WPI centers can be categorized into three groups: Origins of the Universe, Earth, Life, and Intelligence; Life Sciences; and Materials/Energy Sciences.

D. Extension Application Screening of I²CNER, Launched in 2010

I²CNER of Kyushu University applied for a 5-year funding extension, and the screening of its application was conducted by the WPI Program Committee at its annual meeting in September. The Committee examined carefully the center's progress report during the period from the project's launching in 2010 and its progress plan during a possible extended period, along with a report presented by the center's director and host institution's president at the Program Committee meeting and a site-visit report prepared by the Program Officer and working group.

The Committee was impressed with the high level of science being advanced at I²CNER in pursuing its multifaceted challenge to develop the foundations for a carbon-neutral society in Japan. The Committee also found that I²CNER 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 host university. Consequently, the Committee evaluated I²CNER as having achieved "World Premier Status" in ways that fully meet the goal of the WPI Program.

The WPI application guidelines state that the term of a research project support by the WPI Program to be 10 years. A 5-year extension is possible only for centers with “outstanding” results. The Program Committee carried out an extensive discussion on the definition and implications of this “outstanding” status in its 2014 meeting and adopted two principles: (1) 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 each center must be strictly evaluated to determine whether or not it has achieved that high standard. (2) The “outstanding” results that merit a 5-year funding extension are only applicable to exceptional cases that have demonstrated superlative achievements far beyond the very high WPI standard. In accordance with the above principles, the Committee decided that only truly superlative cases of achievement can be considered for an extension beyond the 10-year term. I²CNER was not selected for a 5-year extension, although its performance was highly evaluated as having fully achieved “World Premier Status”, satisfying the high standard of the WPI Program.

E. Follow-up

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

Program Committee

The Committee membership changed slightly in FY 2016: Mr. Hiroto Ishida resigned.

All the Committee members and their affiliations are listed in the following website:

https://www.jsps.go.jp/english/e-toplevel/data/07_committee/PC_member_list.html

The FY 2017 Program Committee meeting was held on 13-14 September in Tokyo. Of its 18 members, 14 participated. The main items of business on the agenda were the selection of two new WPI centers to be launched this year, the screening of an extension application by I²CNER, and progress evaluations of the four 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 site-visit reports and the centers’ own progress reports.

PDs, POs and WGs

PDs: Dr. Akira Ukawa, who had served as the Deputy Director until March 2017, was appointed Program Director starting in April 2017. Dr. Minoru Yoshida was appointed Deputy 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.

PDs, POs and WG members and their affiliations are listed in the following website:

http://www.jsps.go.jp/english/e-toplevel/08_followup.html

AD, AOs and AWGs

AD: Dr. Toshio Kuroki, who had served as Program Director until March 2017, was appointed Academy Director starting in April 2017.

AO: Experts in the research area of the member centers. They chair site visits and prepare site-visit reports for the Program Committee.

AWG: 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:

https://www.jsps.go.jp/english/e-toplevel/18_academy.html

Site Visits

Site visits to the five WPI centers receiving ongoing funding were conducted during the period of June-August 2017.

A full 2-day site visit was only carried out on I²CNER in its 8th year of operation. The members of the site-visit team were the PD, PO, WG, MEXT officials, and JSPS secretariat. The AD participated as an observer. An interested Program Committee member 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 allowed a free discussion between them and site-visit team members.

For the remaining four WPI centers, a half-day site visit without WG participation was conducted on Kavli IPMU which was in its 11th year of operation (following its 10th year

evaluation last year), and on the three FOCUS centers (IIIS, ELSI and ITbM), which underwent their 5th-year interim evaluations last year. The schedule included a briefing by the presidents of host institutions and by the center directors, followed by discussions with them and the site-visit team members.

For all 5 centers, reports of the site visits were submitted to the Program Committee and disclosed to the respective centers.

WPI Academy Site Visit

Four Academy-member centers (AIMR, iCeMS, IFReC and MANA) will receive site visits by the AD, AOs and AWGs at regular intervals, with the first visits scheduled for 2020. In the intervening years, half-day visits will be made by the AD and AOs, starting in the winter of 2017.

F. Follow up on Kavli IPMU, Launched in 2007

Center director: Hitoshi MURAYAMA

Program officer: Ichiro SANDA, Nagoya University

1. Scientific achievements

The Program Committee congratulates Kavli IPMU on the impressive progress it has made since it was launched in 2007. In addition to many theoretical results, several experiments, some of which have taken as long as 10 years to conduct, are now yielding data. The excellent science being advanced at Kavli IPMU is attracting many researchers worldwide.

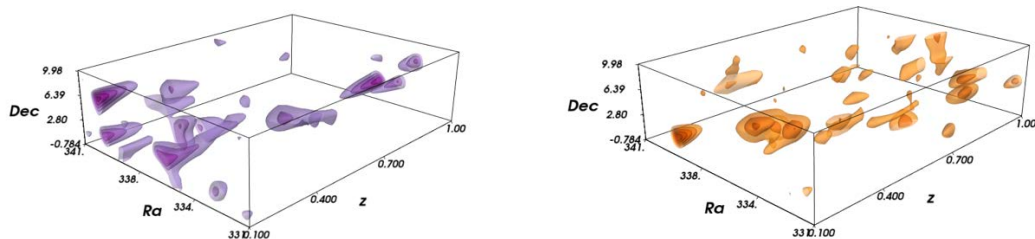


Fig. 3 A 3D map of dark matter over the largest volume ever, about a hundred times larger than the previous studies, reconstructed by weak gravitational lensing analysis of Subaru Hyper Suprime-Cam survey data (left) and 3D map of galaxies in the same field (right). (Credit: NAOJ/UTokyo/M. Oguri)

2. Implementation as WPI center

Kavli IPMU continues to exert momentum as an exemplary WPI center. The Committee looks forward to it making further leaps ahead over the period of its five-year extension.

Interdisciplinary research: Researchers from various fields, ranging from mathematics to observational cosmology, are working together in harmony at Kavli IPMU. It is the Committee's sincere hope that this interdisciplinary research will eventually result in some unexpected breakthroughs.

Internationalization: Kavli IPMU has become a global brand, an important career path, and a sought-after international destination for researchers. It attracts researchers from all over the world, especially young postdocs and doctoral students.

System reforms: The system reforms initiated by Kavli IPMU have spread to other research centers and universities, and are reflected in the content of the system reform promoted by MEXT. The Committee hopes that the University of Tokyo (UT) will take a strong lead in realizing much-needed system reforms, especially in the way that research is conducted in Japan.

3. Efforts toward sustainability

The Committee acknowledges UT's exceptional efforts toward assuring the center's sustainability. However, it may take another 10 years for the world to acknowledge that Kavli IPMU is indeed a first-rate international research center. For this reason, careful nurturing of Kavli IPMU by UT will be essential.

4. Progress plan after WPI grant ends

In addition to the upgrades discussed last year, the new LiteBIRD experiment to study inflation was chosen as one of the projects to be included in MEXT Roadmap 2017. Kavli IPMU is attracting and retaining the best broadly minded scientists from around the world in preparation for furthering its growth after the WPI grant ends.

G. Follow up on I²CNER, Launched in 2010

Center Director: Petros Sofronis

Program officer: Kazunari DOMEN, The University of Tokyo

1. Scientific achievements

Judging from the number of the center's publications included in high impact-level journals, I²CNER has achieved an excellent research program. Progress is especially visible not only in areas which the institute is already strong (i.e. fuel cell and catalytic materials), but also in other areas such as CO₂ and H₂ storage. The mathematical analyses for CO₂ reduction and for energy-related materials research are also going very successfully.

2. Feeding research outcomes back into society

I²CNER has made a number of technology transfers to industries: 33 research result transfers out of 81 collaborative research activities with industry. The Center has also applied for 178 patents and has already been awarded 46. These numbers are quite respectable. Some of this research appear to be close to practical application. It is also appreciated that I²CNER has established an Industry Advisory Board and an Industrial Research Unit to assist in giving its technology transfer process a more concerted format.

3. Implementation as a WPI Center

Interdisciplinary research: The launching of US-Japan Applied Math for Energy initiative clearly shows that a conscious effort being made to more fully integrate the discipline of mathematics into I²CNER research. The center has also hired a new social scientist in its Energy Analysis Division, who is making quick progress and is expected to further promote interdisciplinary research work. The director's top-down funding scheme for interdisciplinary research is also yielding effective results, especially for young researchers.



Fig. 4 Teams of Profs. Tatsumi Ishihara and John Kilner receive Daiwa Adrian Prize at Royal Society ceremony on November 12, 2016.

Internationalization: I²CNER is now a truly global institution as 41% of its PIs and 49% of its researchers come from abroad. Collaborative networks with top researchers around the world have been established. The level of globalization at I²CNER is outstanding when compared to other groups in the field of energy research in Japan.

System reforms: Kyushu University continues to use I²CNER as a driver for system reform throughout the university. It is highly appreciated that President Kubo has established the "Kyushu University platform of Inter/Transdisciplinary Research for Energy (Q-PIT)," which will be a nexus for energy research at the university.

4. Efforts toward sustainability

It is clear that President Kubo and Vice Executive President Wakayama are supportive of

I²CNER's future and are planning to sustain it as a permanent activity within Kyushu University. Q-PIT is also expected to be a nexus for energy research across the entire university.

5. Actions required and recommendations

I²CNER has certainly achieved "World Premier Status", especially in the areas of institutional reform, internationalization, relationship with industry, and transfer of research results to society. Maintaining the level of research in these areas in the future will be a considerable challenge. Accordingly, it will be essential to continue providing the center support from the entirety of Kyushu University, especially from the president. Regarding I²CNER's research, it would be better to develop a clear vision concerning the development of truly innovative and path-breaking energy devices and processes with demonstrative impacts on the primary goal of achieving a carbon neutral society.

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's mission is to solve major social problems related to sleep by (1) elucidating the fundamental mechanism of sleep/wake regulation, (2) elucidating the molecular pathogenesis of sleep disorders, and (3) developing treatments for sleep disorders. Overall, the quality of the center's science is excellent.

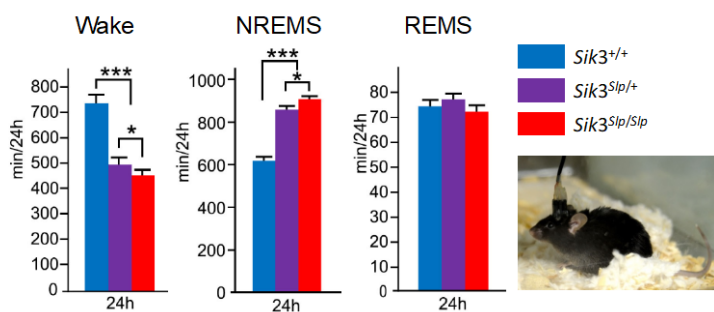


Fig. 5 Discovery of a gene (*Sik3*) regulating sleep time: *Sleepy* mutation of *Sik3* decreases wake time in an allele dose-dependent manner (Funato et al., *Nature* 539: 378-383, 2016)

(1) Funato and Yanagisawa published a seminal paper (Funato, Yanagisawa et al. *Nature* 2016) regarding the isolation of sleep mutant mice (*Sleepy* and *Dreamless*). They identified the corresponding genes as SIK3 kinase and NALCN

non-selective cation channel. They have furthermore explored the intracellular signaling

mechanisms for these gene products. Sakurai found that orexin modulates behavioral fear expression through the Locus coeruleus. Hayashi identified REM-promoting neurons and set the way for long-term REM sleep manipulation. (2) Lazarus showed the direct link between REM sleep loss and a desire for sugary and fatty foods. (3) Yanagisawa and Funato developed novel RBD (REM sleep behavior disorder) model mice, and found that orexin antagonists rescue the RBD phenotype in the mice model and in human patients. Nagase has improved the orexin receptor agonist (YNT-1757) in terms of its activity and physicochemical properties.

2. Implementation as a WPI center

Interdisciplinary research: Although the research conducted at IIIS remains confined to a few fields (e.g. medical, pharmaceutical and biological studies), their work is highly interdisciplinary. The research has a strong core of genetics, physiology, and basic sleep analysis using EEG, neurogenetics, pathway analysis, and human sleep studies. Collaboration with pharmaceutical companies (e.g. Merck Sharp and Dohme (MSD) and Sumitomo Dainippon Pharma Co., Ltd., Nishikawa Sangyo Co., Ltd.) and outside clinicians greatly supplements IIIS's interdisciplinary research activities.

Internationalization: Admission of foreign students.

IIIS has accepted 19 international students. It accepts short-term training students from other countries under the Tsukuba Short-term Study Program (TSSP) and the Campus in Campus (CiC) initiative, carried out to further internationalize the university's research environment. Its 5th annual international symposium was held in December 2016 at Tokyo Conference Center Shinagawa, cosponsored by Wako Pure Chemical Industries, Ltd (200 participants).

System reforms: Cross appointment system.

The University of Tsukuba introduced a cross-appointment system based on IIIS's request in FY 2015. Starting with the Yanagisawa and Liu appointments, there have since been 16 cross-appointments made within the university using this system.

3. Actions required and recommendations

(1) Identifying the substrates of SIK3 kinase is essential to understanding its molecular functions. After identifying the substrates and their phosphorylation sites, phosphorylation

specific antibodies should be prepared to monitor the spatial and temporal activity of SIK3. Pathway analysis is also useful to understanding the signaling pathways mediated by SIK3 and NALCN. (2) Focusing on commercialization will detract from the center's ability to sustain its efforts toward solving more basic science problems, which would be a better way for the center to establish and maintain itself at a level of world prominence in its subject area. (3) A serious problem remains with funding after the WPI grant expires. One of the concerns is the budget for supporting the center's continuation. Tsukuba University should reconsider ways to support IIIS after the WPI grant ends.

H-2. ELSI

Center director: Kei HIROSE

Program officer: Shoken MIYAMA, Hiroshima University

1. Scientific achievements

ELSI has achieved very good scientific results in the field of the origin of the Earth. Hirose et al. studied the possible existence of a power source for maintaining planetary magnetic fields, which is very important in elucidating the origin of life. Ballmer et al. proposed a "BEAMS" (Bridgmanite-Enriched Ancient Mantle Structure) hypothesis which solves the puzzle of the survival of ancient rocks in the convecting mantle. In the field of the origin of life, in advancing research on the chemistry of the prebiotic setting and chemical evolution toward life, Mamajanov et al are conducting a study on messy polymers as potential enzyme mimics.

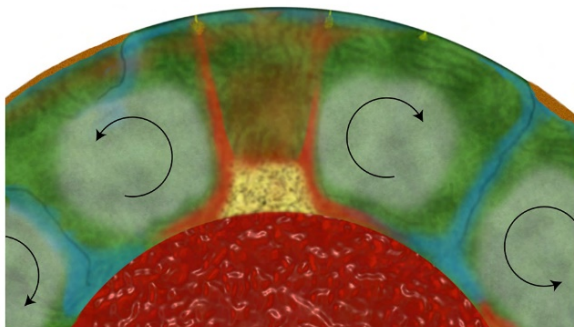


Fig. 6 Numerical simulations by ELSI researchers found an inhomogeneous mantle convection mechanism that can explain why some ancient rocks survived from subduction and subsequent melting (Ballmer et al, *Nature Geoscience* 10, 236-240, 2017)

2. Implementation as a WPI center

Interdisciplinary research: ELSI benefits immensely from the fact that some of the problems upon which it focuses clearly require effort across multiple disciplines. As a good example, Shimizu et al. identified a novel sulfide-responsive transcriptional factor, named SqrR, and described the mechanism by which it responds to sulfides. These findings shed light on early processes in

the evolution of photosynthesis.

Internationalization: The center's internationalization effort is quite successful. In addition to 51% non-Japanese researchers and 5 full-time on-site foreign PIs, the worldwide network established within ELSI and supported by the John Templeton Foundation has enabled the assembling of many overseas postdocs (11 joint postdocs shared with 11 affiliated overseas centers).

System reform: The President states that ELSI is now the role model for a world-standard research hub within Tokyo Tech. He created the Tokyo Tech World Research Hub Initiative (WRHI), which invites world-class researchers to top-level research groups in the university's laboratories, centers and units. He also spoke about the strong support to be provided by the university after the WPI funding ends (tenured posts, funding, etc.).

3. Actions required and recommendations.

ELSI has established a new mentor system for young researchers within its open and flat organization, as required by the WPI Program Committee. The Committee looks forward to this new system helping young researchers in their carrier development while maintaining independence in conducting their research.

It is highly evaluated that within ELSI the number of female researchers is increasing (now at 24%). The Committee would like to ask ELSI to maintain this high level of female participation while making further effort.

Once the new satellite at the University of Tokyo has started operation, it is expected that Dr. Hirose will continue his earnest efforts as the ELSI center director and as the PI of the satellite.

H-3. ITbM

Center director: Kenichiro ITAMI

Program officer: Minoru YOSHIDA, RIKEN

1. Scientific achievements

ITbM continues to make impressive progress and has accomplished enormous scientific achievements including after its interim review. In fact, ITbM has been producing many papers published in high-impact-factor journals, while three of its PIs were selected for

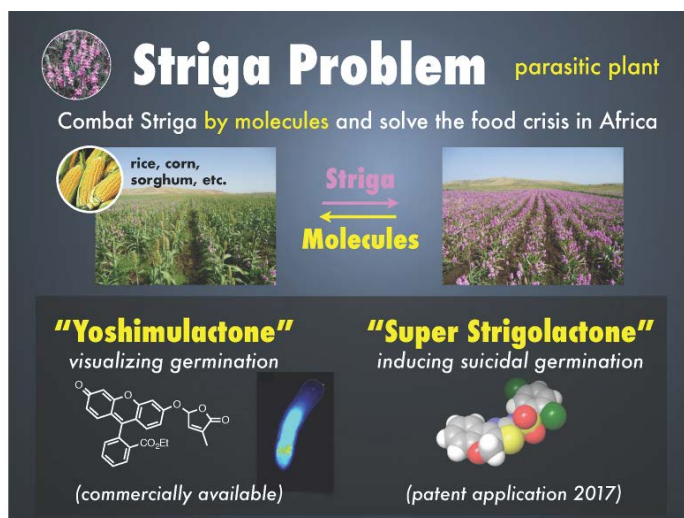


Fig. 7 Development of molecules to combat the parasitic plant Striga

inclusion in the 2017 Highly Cited Researchers list. A core ITbM project is the tackling of the parasitic plant Striga. ITbM has now identified “super-strigolactone,” which potently induces suicide germination in Striga, and has presented a clear roadmap toward the practical use of super-strigolactone in eradicating Striga in Africa.

2. Implementation as a WPI center

Interdisciplinary research: As the concept of fusion has become widespread within ITbM's Mix Lab environment, the number of its joint papers and patents has dramatically increased. Collaboration between computational and experimental science groups is growing rapidly.

Internationalization: ITbM's visibility was further improved by the assignment of two new non-Japanese PIs in FY 2016: Florence Tama and Wolf Frommer.

System Reform: ITbM has created ripple effects across Nagoya University, including the launching of the WPI-next program. In addition, the university has established a department for “Academic Research & Industry-Academia-Government Collaboration” in order to better promote the efficient use of its research outcomes.

3. Actions required and recommendations

ITbM needs a clearly defined long-term vision, including a plan for sustaining its operation after WPI support ends. It will be important for ITbM to maintain a strategic focus on basic science after the establishment of the ITbM Consortium, an association of potential external partners for applied aspects. The Strategic Planning Division (SPD), launched to

promote collaboration with industry and other research organizations, is key to ITbM's sustainability. It would be worthwhile to recruit new talent to strengthen the division's function. Development of a graduate program could reap huge benefits for ITbM. However, there are still barriers existing between departments, which impede the recruitment of more students to ITbM. Nagoya University and ITbM should cooperate and make every effort for success in the application for the Excellent Graduate School program, a new MEXT program, to facilitate the reorganization of graduate schools.

I. New WPI Centers Launched in 2017

In FY 2017, the WPI program has expanded its activity by adding two more centers. As with previous calls for WPI centers, the focus is placed on basic research in natural sciences, and fusion of research areas and creation of new domains are encouraged. Internationalization and system reform continue to be project pillars. In addition, it is explicitly requested that the host institution carry out reform of its own organization in parallel with the establishment of its WPI center. Funding in the amount of ¥700 million a year per center at most is provided over 10 years, without the possibility of extension. Fifteen applications were received for the screening in April and the following two centers were selected.

International Research Center for Neurointelligence (IRCN), the University of Tokyo.

Headed by Director Takao Hensch, IRCN combines life sciences with information sciences in an effort to clarify the essence of human intelligence from the perspective of neural circuit development and neural disorders and to develop new AI technologies, thereby establishing a new field of "Neurointelligence."

Nano Life Science Institute (NanoLSI), Kanazawa University.

Headed by Director Takeshi Fukuma, NanoLSI aims to develop bio-scanning probe microscopy (SPM) and supramolecular chemistry to achieve a nano-level understanding of basic cellular functions and their cancer-specific abnormalities, thus establishing a new research field of "Nanoprobe Life Science."

These WPI centers launched their research in October 2017.

J. Future Plan for WPI Program

In 2015, the Program Committee made a recommendation to MEXT to move forward the

WPI Program (details provided in “WPI Follow-Up Report 2015”). Responding to the Committee’s recommendation, MEXT announced a long-term plan for the WPI Program at the WPI Program Committee meeting in 2016. It included: (i) Calling for two new centers in FY 2017, and possibly more in and after FY2018, up to the maximum of about 20 centers taking into account the capacity and capability of Japanese institutions to implement them; and (ii) establishing a new framework, the WPI Academy, for the purpose of sustaining and advancing the WPI brand.

In line with the program’s long-term plan, two new WPI centers were launched this year, and two more will be called for in FY 2018.

K. WPI Academy and Its Activities

The WPI Academy was launched by MEXT in April of 2017. Its aim is to sustain and advance the WPI brand, serve as a hub for the global circulation of talented researchers, and accelerate the dissemination and application of WPI program achievements, while networking the activities of the various WPI centers. In this way, the WPI Academy plays a vanguard role in internationalizing and reforming Japan’s research environment.

Membership

The WPI Academy centers are those certified to have reached “World Premier Status” by the WPI Program Committee and have promised to actively participate and collaborate in the activities for promoting the overall WPI Program and amplifying its achievements. The initial members of the Academy are the five WPI centers launched in 2007: AIMR, Kavli IPMU, iCeMS, IFRcC, and MANA.

Follow up

Follow up on the WPI Academy centers will be conducted by the WPI Program Committee. In addition to the WPI centers’ four mission objectives (i.e., top quality science, fusion study, internationalization, and system reform), the following points will be evaluated: (i) top-down management and swift decision making by the centers, (ii) proactive and sufficient effort made to enhance the WPI brand, (iii) international talent circulation, (iv) center support by the host institution, and (v) full cooperation by the centers in activities to disseminate WPI Program achievements.

For the purpose of carrying out the follow-up activities, one Academy Director (AD) and one Academy Officer (AO) for each center are appointed. The AD and AO visit the AO’s

assigned WPI Academy Center once every year to confirm the state of its operation. A working group is assigned to each center, comprising the AO and about 3 Japanese and overseas experts. The group conducts a site visit once every three years or so to assess the center's research level and operation. Program Committee members, the PD, and DPD may participate in these Academy site visits as observers. Based on the summary of site visit reported by AD, Program Committee carries out the follow-up of the status of effort by the Academy centers.

International talent circulation

The circulation of top researchers is a key function of the WPI Academy centers as they work to advance research excellence. The WPI Academy centers carry out activities such as the operation of overseas satellites, invitation of PIs and researchers to the centers from abroad, programs for sending Japanese researchers overseas, and holding of international workshops and conferences (WPI Program Center supports these activities by the WPI Academy centers).

Dissemination and application of WPI program achievements

WPI centers have accumulated considerable experience and know-how regarding the internationalization of research systems in Japan. This includes international researcher employment (e.g. advertisement, selection procedures, cross appointments), research environment and support, funding applications (Kakenhi grant application, etc), living support, emergency response (medical, natural disasters such as earthquakes), legal regulations, and many others. Their dissemination and sharing among research institutions is an important activity of the WPI Academy. Collaboration is planned with Okinawa Institute for Science and Technology (OIST), which has considerable experience in these matters.

Financial independence

Securing funding is an important issue in securing the sustainability of WPI centers. For supporting the fund-raising efforts of WPI centers, consultations and training by experts are organized by WPI Program Center.

Branding and outreach

The WPI Academy promotes the WPI brand through various channels. In August 2017, an article on the WPI was placed as an advertisement feature in *Nature Index 2017*. Also in

August, an English version of the volume "10 Year Commemoration of the WPI Program" was published and distributed. In collaboration with JSPS's overseas offices, WPI activities are promoted in countries around the world through symposia held by the offices. The WPI's continued participation in the annual conferences of the American Association for the Advancement of Science (AAAS) provides another platform for heightening WPI visibility.

Domestically, a presentation meeting was held on 24 October 2017 in cooperation with Keidanren (Japan Business Federation). Directors and Vice Directors of the four WPI centers working on materials science (AIMR, iCeMS, MANA and I²CNER) presented reports on their activities and held discussions on possible collaborations with members of industrial organizations. The meeting was very favorably received by the audience, who said that they would welcome such meetings in the future as well.

In previous years, WPI centers took turns in holding joint symposia oriented to the general public and young generations. A fresh title, "WPI Science Symposiums," has been adopted. This fiscal year's event was held in February 2018, titled "An unfolding future."

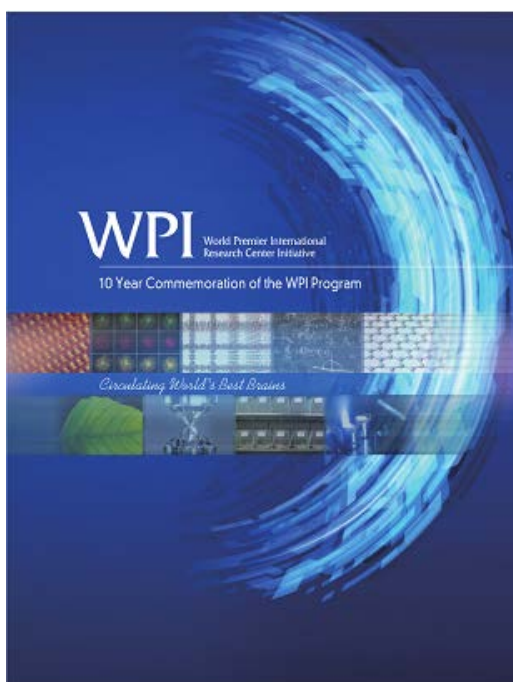


Fig. 8 English edition of 10 year commemoration volume of the WPI Program

In 2010 and 2012, surveys were conducted to examine the extent to which the WPI centers were becoming known internationally, and how they were evaluated by the scientific community. A new survey will be conducted this year. While the previous surveys mainly targeted academia, this year's survey will encompass industry in addition to academia. The results are expected to be released in the autumn of 2018.

Last year, a commemorative book, titled "10 Year Commemoration of WPI Program," which introduces the activities of nine WPI centers and gives an overview of WPI

Program's first decade, was published in Japanese. This year, an English version of the book was published.