



## Follow-up of WPI Program

### By Program Committee

December 2012

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### **Summary**

We are very pleased and proud of that Professor Shinya Yamanaka, Principal Investigator of iCeMS was awarded the 2012 Nobel Prize for Medicine or Physiology for the discovery of iPS cells. The Nobel Foundation stated that his groundbreaking discovery has completely changed our view of the development and cellular specialization.

The missions of the WPI (World Premier International Research Center Initiative) program are ambitious; in addition to top quality of science, we requested internationalization, fusion studies and reform of existing systems, aiming to establish internationally opened and globally visible research institutions in Japan.

Under these missions, 5 WPI centers were launched in October 2007; they are AIMR on materials science at Tohoku University, IPMU on universe at University of Tokyo, iCeMS on cell

biology at Kyoto University, IFReC on immunology at Osaka University and MANA on nanotechnology at National Institute for Materials Science. In December 2010, the sixth WPI center, I<sup>2</sup>CNER, was established on energy issues at Kyushu University.

WPI centers have been followed up closely every year by site visit teams and the Program Committee on their scientific achievement and implementation of the WPI missions. Their efforts are guided by program director (PD) and program officers (POs).

These WPI research centers have reached at a level of world leading institutes in scientific achievement or have great potential to be in the future. 2012-reports of Program Committee and site visit are briefly summarized as follows:

- AIMR is now on the right track to be a world premier center with math-mate strategy.
- Kavli Foundation and University of Tokyo are assisting sustainability of Kavli IPMU.
- iCeMS integrates porous materials into gas signaling of cells.
- IFReC is setting a strategy toward medical immunology.
- MANA is challenging at grand issues, i.e. atomic switch, superconductivity and photosynthesis.
- I<sup>2</sup>CNER is a symbol of US-Japan collaboration, though still in its developing stage as WPI.

All WPI centers are actively engaging outreach activities such as publishing brochures, lectures to general publics and students, science café etc. In FY2011, 6 WPI centers jointly participated in "Science and Technology Festa in Kyoto" and "AAAS Annual meeting" in Vancouver, Canada. In joint-symposium in Fukuoka, more than 600 high school students enthusiastically participated and were excited by lectures of and conversation with top WPI scientists.

The WPI program supports the centers basically for 10 years. Possible extension for another 5 years is applicable to those with outstanding results. Afterwards, these centers are to be sustained basically under the auspices of the host institutions. However, under the present circumstances, it is a challenge for host institutions to afford resources to support the centers. The Program Committee has started to seek measures and pathway for possible extension.

In FY2012, WPI program is expanded by adding 3 more centers under the program of WPI Focus, in which the area of research interest is more focused. Of fifteen applications, following three centers were selected and launched in December 2012.

- International Institute for Integrative Sleep Medicine, University of Tsukuba
- Earth-Life Science Institute, Tokyo Institute of Technology
- Institute of Transformative Bio-Molecules, Nagoya University

### **A. Dr. S. Yamanaka, PI of iCeMS, was awarded The 2012 Nobel Prize**

We are very pleased and proud of that the 2012 Nobel Prize for Physiology or Medicine has awarded Professor Shinya Yamanaka, PI (Principal Investigator) of iCeMS, jointly with of Dr. John B. Gurdon for the discovery that mature cells can be reprogrammed to become pluripotent.

The Nobel foundation announced:

Shinya Yamanaka discovered more than 40 years later (the discovery of John Gurdon), in 2006, how intact mature cells in mice could be reprogrammed to become immature stem cells. Surprisingly, by introducing only a few genes, he could reprogram mature cells to become pluripotent stem cells, i.e. immature cells that are able to develop into all types of cells in the body.



*Professor Shinya Yamanaka, PI of iCeMS*

These groundbreaking discoveries have completely changed our view of the development and cellular specialisation. We now understand that the mature cell does not have to be confined forever to its specialised state. Textbooks have been rewritten and new research fields have been established. By reprogramming human cells, scientists have created new opportunities to study diseases and develop methods for diagnosis and therapy.

### **B. Outline of WPI Program**

In FY2007, MEXT (the Ministry of Education, Culture, Sports, Science and Technology) initiated the WPI Program (World Premier International Research Center Initiative), a highly challenging and long-term program to support the establishment of world-leading research centers.

The WPI Program aims ambitiously at creating globally visible and internationally opened top-world research centers in Japan, in which the world's finest brains gather, outstanding research results are generated, and talented young researchers are nurtured. WPI research centers are expected to be highly innovative in both their concepts and practices.

Following four missions are crucial to be a WPI center.

- Top quality of science
- Internationalization

- Breakthroughs by fusion studies
- Reforming research and administration systems

In FY2007, the Program Committee selected the following five research centers to be funded under the WPI Program:

Advanced Institute for Materials Research (**AIMR**), Tohoku University  
 Institute for the Physics and Mathematics of the Universe (**IPMU**), The University of Tokyo  
 Institute for Integrated Cell-Material Sciences (**iCeMS**), Kyoto University  
 Immunology Frontier Research Center (**IFReC**), Osaka University  
 International Center for Materials Nanoarchitectonics (**MANA**), National Institute for Materials Science (NIMS)

These WPI centers initiated their research activities in October 2007.

In FY2010, the committee selected the sixth WPI center:

International Institute for Carbon-Neutral Energy Research (**I<sup>2</sup>CNER**), Kyushu University for advancing "green innovation". I<sup>2</sup>CNER initiated its activity in December 2010.

In FY2012, MEXT announced WPI Focus, which encourages more specific subjects. Of fifteen applications, three proposals were granted after hearing by the Program Committee. See, Section G on page 18.

These WPI centers are supported for a period of 10 years as they meet the above four requirements. And there is possible extension for another 5 years for projects with outstanding outcomes. The Program Committee started discussion on conditions for possible support after 10 year period. See, Section F on page 17.

### **C. Change of members**

In FY2012, the following members were newly appointed to the Program Committee

Dr. Y. Harayama, Deputy Director, Directorate for Science, Technology and Industry, OECD  
 (As of October 2012)

Dr. H. Miyahara, President, National Institute of Information and Communications Technology (NICT)

Dr. M. Nakamura, President, Japan Science and Technology Agency (JST)

Dr. S. Ohgaki, President, National Institute for Environmental Studies (NIES)

Dr. M. Takeichi, Director, RIKEN Kobe Institute

The following members left from the Program Committee:

Dr. A. Iiyoshi, Chancellor, Chubu University

Mr. Y. Kobayashi, Former Chairman of the Board, Fuji Xerox Co., Ltd.

Dr. S. Suematsu, President, Takayanagi Foundation for Electronics Science

We much appreciate for their great contributions to the WPI program during the past 5 years.

Members of the Program Committee are listed in the following URL:

[http://www.jsps.go.jp/english/e-toplevel/07\\_committee.html](http://www.jsps.go.jp/english/e-toplevel/07_committee.html).

New Program Officer (PO) of iCeMS, Dr. T.Nakano, Osaka University, succeeded from Dr. T.Suda, Keio University, who remained in the Working Group (WG) for iCeMS.

In addition, some members of WG have been changed (See, URL.

[http://www.jsps.go.jp/english/e-toplevel/data/08\\_followup/FY2012WGMembers.pdf](http://www.jsps.go.jp/english/e-toplevel/data/08_followup/FY2012WGMembers.pdf))

#### **D. Follow-up**

WPI centers are followed up for their scientific achievement and implementation of the WPI missions by site visit and the Program Committee.

In post-interim evaluation, the following viewpoints were considered:

1. World top-level research is being carried out.
2. A proactive effort continues to be made toward WPI missions.
3. A steadfast effort is being made to secure the future development over mid-to-long term.

#### **Site visits**

Site visits to the six WPI centers were conducted over two days during June –August 2012 by PD, PO, international WG members, MEXT officials and JSPS secretariats. The schedule included a briefing by the center director, presentations by selected PIs, and poster presentations by young researchers, guided tour to facilities and comments/advices of site-visit team members.

PD, POs and members of international WGs are listed at the following URL:

[http://www.jsps.go.jp/english/e-toplevel/08\\_followup.html](http://www.jsps.go.jp/english/e-toplevel/08_followup.html).

Reports on the site visits were submitted to the Program Committee and disclosed to corresponding WPI centers.

#### **Program Committee Meeting**

The annual Program Committee meeting was held on October 23 and 24, 2012 with the participation of PD, POs and MEXT officials and JSPS secretariats. Hearing was conducted on the 6 WPI Centers regarding their scientific achievements and mission implementation as WPI

Centers, as well as responses to items pointed out by the interim evaluation.

### Interim Evaluation

In October 2011, interim evaluation was made and scored for the first 4 years performance.

Results of the interim evaluation were found in FY2010-report

([http://www.jsps.go.jp/english/e-toplevel/data/08\\_followup/FY2010result\\_e.pdf](http://www.jsps.go.jp/english/e-toplevel/data/08_followup/FY2010result_e.pdf)).

Interim evaluation are briefly summarized as follows:

- AIMR; B: Failed in tackling a challenge to create a new materials science beyond the existing institute, although world class scientists gathered.
- Kavli IPMU; S: Established itself as a world-renown institute during a short period from scratch.
- iCeMS; A-: Still a few visible interacting studies between cells and materials. Diverse and ambiguous identity.
- IFReC; A: Keeping very high scientific standard from the start. Successful fusion studies among immunology, imaging and informatics.
- MANA; A: Becoming a world-leading institute in materials science and attracting scientists from all over the world.

### D-1. AIMR

#### 1. Achievement of science

- AIMR achieved a dramatic turn-around of the institutional strategy after the interim evaluation. The entire impression of AIMR is much changed by new Director, Professor M. Kotani.
- As math-mate collaboration, AIMR were proposed 3 target projects, i.e. “non-equilibrium materials”, “topological functional materials”, and “multi-scale hierarchical materials”. These targets may lead to success of the new challenge and give an impact on material-science community.
- Progress of spintronics was most impressive. The research of this group is unique and can be expected to bring an original concept.
- AIMR has developed a number of very powerful and cutting-edge tools for experimental research such as scanning tunneling microscopy and angle-resolved photoemission spectroscopy.



*Professor M. Kotani, AIMR director since FY 2012.*

#### 2. Implementation as a WPI Center

- **Fusion:** Newly organized “Interface Unit” with six talented young researchers is unique in

catalyzing materials researches and mathematics and thereby, playing a key-role for the future success of fusion research.

- **Internationalization:** Considerable efforts were made on the internationalization, recruiting 44 % (14/32) of PIs (permanently or temporarily staying), 48% of researchers and 70 % of postdocs from abroad.
- **Management:** Management system is improved by inviting Dr. Tsukada (previous PI, theorists) as Administrative Director.

### **3. Steadfast effort being made to sustain the center's development**

- The Executive Vice President Dr. Ito announced enthusiastically the support to AIMR by the University as a role model of University reform and promised continuous support by the host institution.
- Tohoku University will establish a Task Force to establish a new center for materials research, integrating all materials research using AIMR as the core.

### **4. Actions Required and Recommendations**

- 1) The director introduced a new culture and paradigm to materials science field. Now AIMR became a visible existence and seems on the right track to be a world premier institute. We are looking forward to seeing emergence of unique scientific accomplishments, although in its nature we must wait for a while.
- 2) The next two years will be crucial for the Center for sustainability of the center.
- 3) There should be some boundary which could not simply be resolved by the concept of math-mate collaboration, for example, in some synthetic chemistry. Serious discussion is necessary what fields in the materials science could be covered or should be challenged by the AIMR's new concept.
- 4) What are the real benefits to the Lab brought by the 3 satellites and 16 partners and by the large number of oversea PI?

## **D-2. Kavli IPMU**

### **1. Achievement of science**

- The Director has managed the new Institute to become a globally visible Center of Excellence, and a vibrant place to discuss ideas. Kavli IPMU attracts young researchers world wide. They find easily their next positions in first-rate institutes.
- The Institute is really interdisciplinary : Physics, Mathematics and Astronomy, with contributions of theorists and experimentalists.

### **Experimental Physics**

- The experimental programme includes two major instruments on the Subaru telescope,

three underground experiments in the Kamioka underground laboratories, and participation in BELLE II.

- The elucidation of the nature of dark energy, dark matter, neutrinos, and CP violation form the centerpiece of the experimental programs of Kavli IPMU. This year many experimental activities have blossomed and deserve special attention.

### **Theoretical Physics**

- Kavli IPMU theoretical physics covers string theory, phenomenology, cosmology, astrophysics. Significant advances and breakthroughs were noted in their respective fields. String group received crucial guidance, energy and inspiration from PI Hirosi Ooguri.

### **Mathematics**

- High quality of young faculty members and postdocs in the Math group is most impressive. Singularity theory and topology has been applied to astronomical problems. The relation between gravitational lensing theory and Finsler geometry is a new connection between mathematics and astronomy.

## **2. Implementation as a WPI Center**

- **Fusion:** Compared to the previous years, mathematicians are now collaborating actively with physicists. Concrete publications have resulted in three areas. Collaboration among experimentalists and theorists are also going well. Some communication difficulty was noted between experimentalists located in Kamioka and theorists located in Kashiwa.
- **Workshop:** Kavli IPMU is also notable in its outstanding workshop activities in spite of the unfortunate setback resulting from the 2011 earthquake. We can only encourage Kavli IPMU to continue these workshop and conference activities.
- **Postdoc:** Another measure of globally visible research center is to note where postdocs come from to join the institute, and where they go for the next position after their appointment. In 2011, 23 out of 24 IPMU postdocs found new positions at world's major institutions. In 2012, this number was 19 out of 20.

## **3. Steadfast effort being made to sustain the center's development**



- Kavli Foundation endowed \$7.5 M. It is managed by Kavli Foundation, and the return on the endowment is given to Kavli IPMU perpetually. Accordingly, IPMU will bear the name of the donor, Kavli, which will bring wider global recognition.
- University of Tokyo (UT) established TODIAS (Todai Institutes for advanced study) on January 2011, in which Kavli IPMU became the first institute.
- President Hamada allocated a few tenure positions to IPMU.



*Mr. Kavli, F. (center), Chairman of the Kavli Foundation, met Prime Minister Noda, Y. (right) with Professor Murayama, H. (left) on May 9, 2012.*

#### **4. Actions Required and Recommendations**

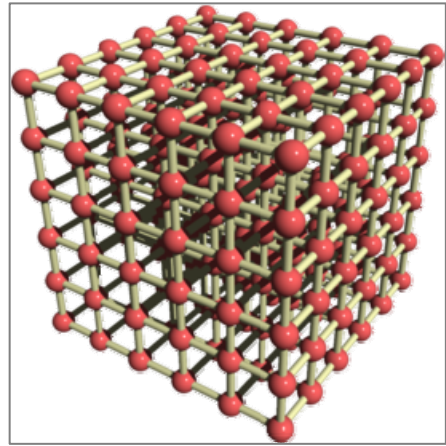
- 1) The very large breadth of Kavli IPMU research topics show the ambitions and energy of all players. Nevertheless for the next phase, a certain focus could be appropriate to build a critical mass.
- 2) The limited duration of the WPI program provides some difficulties in hiring new ones or in keeping top-notch researchers when they are offered steady positions.
- 3) Nevertheless, departure of young scientists is in a sense unavoidable when really talented scientists have been hired, indicating that the center is becoming a step board for young scientists' career. Some clever management scheme is necessary to sustain the WPI activity in spite of the loss of talents.
- 4) With the establishment of TODIAS, UT is in a position to give a certain number of tenured positions to IPMU, but the given access to a few positions is not sufficient enough. Joint appointments of professors with both Japanese or foreign institutions should be pursued.
- 5) Efforts to secure permanent resource beyond WPI are necessary for the longer term.
- 6) Rapid presentation of protocol and roadmap for the 5-years extension under the WPI program is desirable.

### **D-3. iCeMS**

#### **1. Achievement of science**

- Dr. Shinya Yamanaka was awarded The 2012 Nobel Prize in Physiology or Medicine.
- Dr. Kitagawa's novel porous materials were applied to NO gas signaling in cells, exploiting significant potential in studying gas signaling in cells. This is a good example of the fusion study between materials science and cell biology.

- Chemical biological approaches for detection and transcription of stem cells showed some progress this year, although their molecular understanding and biological significance are not clear yet.
- Basic studies of iPS cells in CiRA are now involved in iCeMS; one group of CiRA with 6 researchers is now elucidating mechanisms behind reprogramming of cells.



*Porous material by Kitagawa*

## 2. Implementation as a WPI Center

- Many young researchers devoted interdisciplinary research in various aspects, thanks to Director's administrative efforts. However, there seems no strategy in fusion between materials science and stem cell biology.
- Toward the success and sustainability of iCeMS, many aspects of reinforcements in the scientific administration are required, although administrative organization of iCeMS was an excellent and advanced one.

## 3. Steadfast effort being made to sustain the center's development

- Proposal to change of Director from Dr. Nakatsuji to Dr. Kitagawa was approved by the program committee.
- President Matsumoto announced the future strategy of Kyoto University and emphasized the necessity of the hub organization integrating different disciplines. Although iCeMS was not particularly nominated, it should be a strong candidate in organization of these plans.

## 4. Actions Required and Recommendations

- 1) The mission statement "to create new disciplinary fields through integration of cell and materials sciences with a focus on stem cell science and technology and mesoscopic science and technology" is still too diverse and ambiguous. Clear identification of the current mission as well as plans for the next 5 years is needed.
- 2) New director should clarify and implement his vision and agenda for the next 5 years. It is not clear how the change of Director will affect the strategy of the institute as well as composition of the PIs.
- 3) Integration of material science into cell biology has considerably progressed in this one year. This line of study should be further extended to various aspects of cell biology. Taking this success into account, reconsideration and focusing of research strategy are recommended. Upon critical reviewing the ongoing research subjects, some projects that

are not promising or not closely related to the recent progress had better be excluded from or less emphasized in the plans of iCeMS.

- 4) Several works seem to lack biological and mechanistic insight. More critical appraisals should be pursued from cell biologists.

#### D-4. IFReC

##### 1. Achievement of science

- The scientific achievement was superb, which is evident by the number of papers (214 in 2011), especially those in high-impact factor (IF) journals (10% of the papers in well-respected journals with IF >14), and prestigious prizes, notably the Gairdner to Dr. Akira, Japan Prize to Drs. Kishimoto and Hirano, and Japan Academy Prize and Asahi Prize to Dr. Sakaguchi.
- IFReC successfully integrated imaging and bioinformatics into experimental immunology for spatio-temporal studies in vivo from molecular to whole body level.
- Most of the important and modern imaging equipment, including 11.7T MRI, super-resolution microscope, Raman-microscope, and electron-microscope, are now functional in IFReC.



*IFReC researchers are now working under-one-roof.*

##### 2. Implementation as a WPI Center

- **Fusion:** Compared with previous years, many of the projects joined immunology with imaging, and/or bioinformatics. Thus, fusion of research areas is proceeding well and resulting in innovative projects. The intramural fusion grant and double-mentoring fellowships, as well as new colloquia are good efforts in this direction.
- **International conferences:** There is also a conscious effort to reach out both to young scientists and the international community, in particular, the winter school in Singapore could potentially help IFReC to recruit both international and female scientists
- **Turnover of PIs:** The significant decrease in the average age of the PIs (from 54.1 years old in 2008 to 50.2 years old in 2012) is a good sign that IFReC is investing in developing new talents. Several of the new junior recruits have very exciting research programs that fit well with IFReC's goals, especially fusion of disciplines.

##### 3. Steadfast effort being made to sustain the center's development

- The relatively recent recruitment of Professor Sakaguchi was an excellent move, and his impact is already being felt. His work, spanning mouse and human systems, has substantial translational potential for multiple immunological diseases and cancer. This line of research direction seems future implementation at IFReC.
- Medical immunology is one of the ultimate goals of IFReC, which is a most urgently needed area of research for advancing our basic knowledge of the immune system to the bedside.
- Strong leadership will be necessary in planning IFReC's future beyond 2017. Direct and continuous communication between IFReC and the central administration of Osaka University is advised.

#### **4. Actions Required and Recommendations**

- 1) Significant fusion efforts were made, but still seem a unilateral interaction. The provision of urgent and important issues to the imaging sector by immunology group is crucial in more concrete and attractive manners. Effective designs to attract the basic-imaging researchers to specific and important questions in immunology are also needed.
- 2) Considering the behindhand situation of medical or human immunology in Japan, IFReC is expected to be a driving force of the fields. However, the present approaches of IFReC remain rather sporadic. A task force discussing medical immunology may be needed to create steady planning and communication environments between IFReC investigators and clinicians/physician scientists.
- 3) The recruiting of women PIs seems to be especially challenging for this institute. The Director might need to examine some different approaches and get some advice and assistance from institutions which have had more success.

#### **D-5. MANA .**

##### **1. Achievement of science**

- MANA is on the right track of being as a world leading institute in materials science, which is evident not only from scientific achievement but from awards, funding, citation ranking and publication of special issues on MANA.
- MANA opened new frontier in nanotechnology. Several research subjects can be recognized as pioneering achievements; these include atomic switch, neural network for computation, superconductors, nano-sheets, boron nitride nano-tubes, artificial photosynthesis and quantum dot bio-imaging.
- In response to the previous site-visit comment, two theorists joined MANA (one from NIMS and one from UK) to form a lineup of seven theorists and started to collaborate with experimentalists. Thus, their collaboration improved very much in the fields of nano-system, nano-materials, and nano-power.

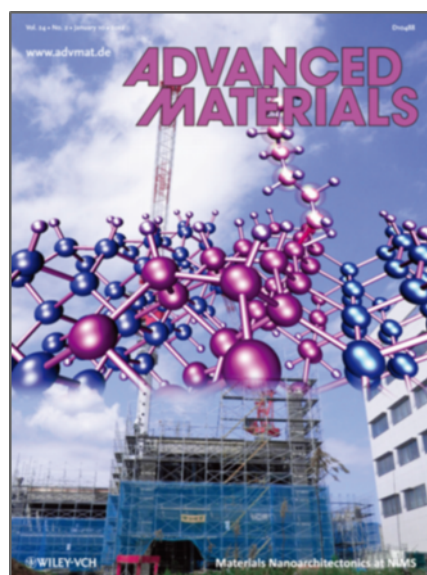
- Fusion of materials and life science is still fragmentary and need more effort to improve the activity.

## 2. Implementation as a WPI Center

- **Fusion:** Fusion researches are stimulated by systematic and strategic funding such as Grand challenge fund, Grand challenge meetings, MANA seminars, etc. This should be continued and strengthened even more.
- **Internationalization:** MANA is a role model of internationalization; 37.5% (9/24) of PIs, 53.6% (105/196) researchers including graduate students and 85.3% (58/68) postdocs are foreign origin.
- **Global visibility:** Publications of special issue on “Science and Technology of Advanced Materials” and “Advanced Materials” as well as on-line newsletter “MANA Research High Light” certainly enhance the global visibility of MANA.

## 3. Steadfast effort being made to sustain the center’s development

- MANA becomes now one of 3 major divisions of NIMS since 2011. Almost equal amount of budget and many positions are provided by NIMS (more than 80 MANA scientists are tenured NIMS researchers). These indicate steadfast support of the host institution for sustainable development of MANA.
- The proposal of reorganization of 5 governmental research organizations including NIMS may give some influences upon MANA. However, daily operation of MANA activities may not be influenced. It is important for MANA leaders to make efforts avoiding bad effects due to this kind of administrative move, rather making use of it for positive direction.



*Special issue of “Advanced Materials” dedicated MANA. Cover is the MANA building under construction.*

## 4. Actions Required and Recommendations

- 1) Reinforcement of Nano-Life is needed if MANA considers it as a major target of research. Vivid interactions between materials scientists and biologists are strongly recommended. In addition, advisory committee consisting of biologists or medical doctors seems necessary to find good collaborators.
- 2) The PI’s are not paying sufficient attention to framing their projects in terms of the most fundamental science questions underlying the results they get. Once these questions are

properly framed, one can see what needs to be done or to understand, and what new experiments or theory might lead into new areas of science.

- 3) Internationalisation of staff is achieved to a high level and extended to NIMS; but why such a small number of Japanese postdocs ?
- 4) MANA should take steps to ensure that its researchers are not limited by confidentiality agreements that may hold over from other work (for companies or in other NIMS projects). MANA needs a clear policy regarding restricted research, which means any research with restrictions on publication.
- 5) Strategy for 5 year extension after 10 year period, and mid-term and long term strategy to sustain the center's development should be drafted until the next site visit. Discussion at the task force team might be desired.

## D-6. I<sup>2</sup>CNER

### 1. Achievement of science

- Scientific achievements within FY2011 are clearly visible in the fields of hydrogen production, hydrogen storage materials, and materials transformation. However, some research projects need to be carefully examined and redesigned in terms of their relevance.
- I<sup>2</sup>CNER has developed unique schemes to induce collaborations and fusion work among different scientific disciplines such as "Institute Interest Seminar Series."
- The introduction of the Energy Analysis Division (EAD) is a distinct advance and will be very helpful for I<sup>2</sup>CNER to establish its own vision and roadmap toward a carbon-neutral society and also to identify primary research themes and defining time scales of target technologies.



*Professor Petros Sofronis,  
Director of I<sup>2</sup>CNER*

### 2. Implementation as a WPI Center

- **Global visibility:** Under the leadership of Director, the institute has been making continuous efforts toward the establishment of a globally visible research base during FY2011. As a result, I<sup>2</sup>CNER has improved considerably its visibility as a major research center aiming at future hydrogen technologies
- **Japan-US collaboration:** It is commended that I<sup>2</sup>CNER is now a symbolic presence of collaboration on energy issues between Japan and the US, and policymakers are very much interested in the future evolution of I<sup>2</sup>CNER.
- **Tenured positions:** For I<sup>2</sup>CNER to be successful, and for the center to continue after

the 10 (or 15) year government funded lifetime, tenured positions are essential. Kyushu University (KU) must find a way to make this happen.

- **Outreach:** Under the auspices of I<sup>2</sup>CNER, 6 WPI centers organized a joint symposium mainly intended for high school students. More than 600 high school students enthusiastically participated and were excited by lectures of and conversation with top WPI scientists(See Section E on page 17)

### 3. Actions Required and Recommendations

I<sup>2</sup>CNER needs to involve more mission-conscious PIs and develop a more consolidated strategy. The following are the mandatory requirements to fulfill and the recommendations to be seriously considered before the interim evaluation in 2014.

#### 1. *Science and PIs:*

- There is still a need for the mindset and incentive of PIs to be improved to meet the general mission of the WPI program as recommended by the Program Committee.
- It seems that the research subjects are somewhat fragmented. There are missing subjects that are indispensable to materialize the carbon neutral society.
- Publications are not sufficient as an internationally competitive center supported by sizable funding. I<sup>2</sup>CNER should take any possible actions to encourage the members to make their utmost effort to increase quantity and quality of their publications. They should note the WPI affiliation and acknowledge WPI in their publications.
- The efforts should be prioritized to recruit first-class scientists globally, while replacements must be sought to increase the level of science with new perspectives.
- At least 10% of full-time staying foreign PI's at KU should be achieved.
- The EAD needs to produce a road map with milestones, to identify the main difficulties to overcome, and to describe a quantitative or at least qualitative strategy to solve them. The EAD should hopefully be a scientific adviser for Japanese and US energy policy makers.

#### 2. *Administration:*

- Director's strong leadership should be a key for I<sup>2</sup>CNER's success and also for a major reform in the KU's administrative system. It must be kept and made even more effective with more Associate Directors' supports and tight collaboration with all PIs.
- Director's stay in KU was considerably increased in FY2011. So far in FY2012, his stay at KU has just reached about 50% of his time, and this needs to be sustained if not increased.
- The budget and expense of each fiscal year should be more clearly written and explained in the I<sup>2</sup>CNER progress report for evaluation.

- Administrative Director should much more proactively advise Director, PIs and President of KU on the establishment of I<sup>2</sup>CNER as a WPI center.

### 3. Fostering young researchers:

- The number of post-docs still remains extremely small, counting only 8. While the WPI budget allows such funding, only 15% of the budget was spent for personnel including postdocs, compared to 60-70% in the preceding 5 WPI centers.
- Recruitment of top young scientists is to be continued by enforcing strategy to attract students and PDs.
- Much more must be done to assure the long term future of young faculty and to allow them build their own careers. They should be provided opportunities for teaching and supervising students.

### 4. International collaboration:

- For the linked development of KU and the Satellite Center at University of Illinois (UI), the exchange and lateral visits of PIs and other researchers should be more encouraged. The period of their stay should be long enough to produce substantial outcomes of collaborative research work.
- The mix of national and international recruited young researchers should be even more enhanced.
- A joint (or split-side) PhD program between KU and UI should be considered, allowing Japanese PhD candidates to be exposed to the US systems early in their career. Conversely, KU actively responds to potential young international researchers.

### 5. Commitment of KU:

- The WPI program offers a chance for KU to reform the existing academic structure and establish a world-leading research institute in KU. It must commit more proactively in guiding the institutional development of I<sup>2</sup>CNER.

## E. Outreach activities

The WPI program recognizes the importance of outreach activities, aiming at public awareness and understanding of science. All the WPI centers hire scientists/specialists being designated to outreach activities. These include publishing brochures and pamphlets, providing lectures to general publics, teaching to primary, secondary and high school students, organizing science café, holding press release etc. In FY2011, six WPI centers organized jointly the following three events:

- **“Cutting-Edge Sciences and Your Future” in Fukuoka:** A joint Symposium of the



WPI centers “Cutting-Edge Science and Your Future” was held under the auspices of I<sup>2</sup>CNER in Fukuoka on November 12, 2011. More than 600 participants, mostly high school students are enthusiastically participated and joined panel-discussion with lecturers from 6 WPI centers (left photo). It is most noteworthy that so many students crowded around the booths of the WPI centers and posed questions to WPI scientists (right photo).



This year, the second WPI joint symposium was held on November 24 in Tsukuba with more than 600 participants.

- **“Science and Technology Festa in Kyoto”**: Science and Technology Festa in Kyoto is organized under auspices of the Government with the aim of increasing public awareness and understanding of science and technology. Following 2010, WPI centers had a joint booth in the “2011 Festa” on December 17-18.
- **“2012 AAAS Annual Meeting”**: The 6 WPI centers presented their activities at the 2012 American Association for the Advancement of Science (AAAS) Annual Meeting held at the Vancouver Convention Center in Vancouver, BC, Canada, on February 16-20, 2012. The WPI booth was open in the Japan Pavilion (organized by JST), to which about 2,700 audience members visited. This was the first overseas event for the WPI centers.

#### F. Sustainability of the WPI centers

Sustainability of the WPI program is envisioned from the beginning, as clearly described in “Application guideline” in 2007:

- The project proposal should not be limited to activities supported by the program grant, but should be both comprehensive and long-term in scope independent initiatives taken by the center, host institution, and partner institutions and include forecasted activities to be conducted after the grant period has ended. (*7. Formulating project proposals*)

Implementation period of the program is:

- 10 years, with possible 5-year extension for projects with outstanding results. An interim evaluation will be carried out five years after the project starts. Projects may be

revised or terminated early depending on the results of the evaluation. *(4. Implementation period)*

Therefore, sustainability is a subject to be evaluated as follows:

- Can efforts to sustain the center as a world premier international research center be expected after program funding ends? *(9. Selection of institutions, (2) Evaluation areas and criteria)*

On the occasion of site visits, WPI centers expressed serious but natural concerns on uncertainty after FY2016 (April 2017), e.g. in the report of Kavli IPMU (D-2). PD and PO asked centers and host institutions to seek a pathway to sustain the centers and maintain their activities beyond the 10-15 year term of the WPI program. Establishment of "Task force" is advised at each host institution and center.

- As mentioned in the above guideline, host institutions are primarily responsible to sustain their center. In reality, however, under the present financial circumstances, it is a challenge for host institutions to afford resources to support the WPI centers that require a large amount of budget.
- Considering these situations, the Program Committee discussed on possible extension after 10 years period. Measures and roadmaps will be shown and in parallel, dialogues with host institutions will be commenced.

#### **G. Selection of new WPI centers**

In FY2012, the WPI program is expanded by adding three more centers under the program of "WPI Focus", in which the area of research and the size of center are more focused.

Furthermore, it is encouraged to exploit previous efforts of center-building initiatives. Research areas are not specified. It is expected that new centers will develop more sharp strategies, implement agile but bold management and gain an international recognition for their distinct characters.

Of fifteen applications, six were subjected to hearing by the Program Committee and finally three were selected. These are:

- International Institute for Integrative Sleep Medicine; Director, Dr. Masashi Yanagisawa  
University of Tsukuba
- Earth-Life Science Institute; Director, Dr. Kei Hirose; Tokyo Institute of Technology
- Institute of Transformative Bio-Molecules; Director, Dr. Kenichiro Itami; Nagoya University

These WPI centers were launched in December 2012.