WPI Program FY2008 Follow-up Report

World Premier International Research Center (WPI) Initiative Program Committee

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Summary

Scientific achievement and project implementation of the WPI research center in FY2008 have been reviewed by the follow-up committee as well as through site visits to the WPI centers.

All five WPI centers are undoubtedly operating at a highest level in their research and have great potential to be world top-level institutes in the future. Most WPI centers have made consistent effort to establish themselves as a globally visible research center over this one-and-a-half year period. Among them, IPMU and MANA have made sound progress towards the goal of WPI Program, and can be seen as leading models for WPI research centers.

However, the committee remarked that further improvements are required to meet the WPI program objectives, including overall strategy, fusion studies, internationalization, strategy for oversea satellites and leadership of their directors.

We expect all the centers to further their efforts in creating genuine top world–level research centers in Japan.

A. Outline of WPI Program

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

To enhance the level of science and technology in Japan and continuously trigger innovation that serves as an engine for future growth, it will be necessary to boost the nation's basic research capabilities while strengthening its global competitiveness.

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

In October 2007, MEXT 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)

B. Review Process

Site visits

Site visits were conducted in November 2008 to February 2009. Although the first site visits in April 2008 was of a preliminary nature, the second site visits took 2 days and examined the centers' scientific progress and project implementation in establishing themselves as world-visible research centers.

Scientific achievement of each center was evaluated by an assigned working group comprising about 5-6 specialists in the subject field, half of whom were as a rule overseas members.

Schedule of the site visits were as follows:

Day 1: Pre-site visit discussion by the site-visit members; Briefing by the center director; Presentations of selected principal investigators (PIs); Interviews of overseas researchers; Interviews of young Japanese researchers
Day 2: Guided tour of research sites and facilities; General discussion with center staffs; Preparation of the site-visit report

Follow-up meeting

After the first follow-up committee on May 2008, the second follow-up committee was held on March 17, 2009 in Tokyo, in which 16 international members of the committee, a program director (PD), program officers (POs), representatives of MEXT and the Japan Society for the Promotion of Science (JSPS) participated.

Meeting was chaired by Dr. Hiroo Imura, chairperson of the WPI program committee. Its schedule included:

Summary report by PD; Progress reports of WPI research centers, presented by the president of the host institution and the center director, followed by report of corresponding PO; Closed discussion; Scientific presentation by two members of IPMU.

Reports

Reports of the site visits and the comments made by follow-up committee members are sent to the corresponding WPI centers as appropriate guidance for making further improvements.
Summary of these reports is provided in Section C and edited comments of follow-up committee members in Section D.

C. Summary of Review

1. Quality of Science

All the WPI research centers are conducting a very high level of research in their respective research areas.

AIMR (Tohoku University): A high level of basic research and innovative technology is being conducted. Some new materials and devices are being applied e.g. to information technology. Discovery of bulk metallic glass (BMG) by Dr. Akihisa Inoue, PI and the president of the host institution, is highly reputed worldwide. Tohoku University is ranked 3rd in citations over the past 5 years in the field of material sciences. However, the follow-up committee pointed out that in order to create a new materials science, a clear strategy is needed for establishing a new institute beyond the existing institute (Kin-Ken, Institute for Materials Research.)

IPMU (The University of Tokyo): The concept behind IPMU is unique in that it brings physics and mathematics together in understanding the universe. Planned research on strings and cosmology seems promising. Experiments performed at Kamiokande have already achieved world–wide reputation.

iCeMS (Kyoto University): Cellular reprogramming using iPS cells established by Dr. Shinya Yamanaka, PI, was chosen again as “Breakthrough of the Year 2008” by *Science* after 2007. Chemical materials developed by Dr. Susumu Kitagawa have a large potential for application.

IFReC (Osaka University): Osaka University is a world leader in immunology, identifying many cytokines and signaling pathways for immune response as well as molecular mechanisms of immune regulation. Papers on innate immunity by Dr. Shizuo Akira, the center director of IFReC, have been ranked “most cited” over several years.

MANA (NIMS): MANA reformed its research organization by realigning five previous technical fields into four research fields: Nano-materials, Nano-system, Nano-green and Nano-bio, which makes visible the mission of MANA. NIMS is ranked 4th in citations over the past 5 years in the field of material sciences. However, the follow-up committee pointed out that distinctive research outcomes are not yet seen.

2. Research Related Matters

Funding: WPI Program is not a vehicle for distributing large amounts of research funding. WPI funds can be used principally for employment of personnel, purchase of research equipments, and starting up researchers and administration. Research money should be secured by individual researchers from other sources, including Grant-in-Aid for Scientific Research (Kakenhi) etc. It seems that all the WPI researchers are successful in obtaining enough research money.

The host institutions place the WPI project within their most high-priority strategic initiatives and provide strong financial support, especially for facilities.

Facilities: Research infrastructure, e.g. buildings, space, administrative and technical support, is essential to achieving the objectives of the WPI projects. All of the WPI research centers moved or are in the process of moving to new facilities. However, research facilities of AIMR, iCeMS and IFReC will be split into two or three buildings within a close distance or on another campus, while MANA and IPMU have/will have a single building where all the PIs can work together.

AIMR: A new building is almost finished adjacent to Institute for Materials Research, a matrix institution. However, only limited numbers of PIs will be accommodated and the rest will stay in their present facilities separately. Therefore, strong arrangements for communication among research groups and researchers are needed.

IPMU: A new building will be completed in fall 2009 at the Kashiwa campus.

iCeMS: PIs will be separated into three buildings, one of which will be used exclusively for CiRA (Center for induced pluripotent stem cell Research and Application). Therefore, strong arrangements for communication among research groups and researchers are needed for iCeMS to be a unified WPI center.

IFReC: Immunology group will be accommodated shortly in a new building adjacent to Research Institute for Microbial Diseases, a matrix institution, while imaging groups will be separated in a facility at another end of the campus. Again, strong arrangements for communication among these two research groups and researchers are needed to achieve successful fusion.

MANA: All the PIs are now accommodated in a single building following the suggestion of the previous program committee.

Female researchers are very few in number at these WPI centers, accounting for 3.4% of PIs (4/116) and 11% of total researchers (59/547). More efforts are needed to recruit female researchers and to prepare their supporting systems.

Efforts: Some of the Japanese PIs continue to hold concurrent positions in their matrix faculties (Ken-nin). It is important for them to share sufficient time and effort with WPI centers.

Young researchers: It will be an important task to foster and train young investigators as the successors of the 10-year projects. Working with top-notch researchers will have a strong impact on young scientists. Host institutions are requested to provide for fostering graduate students at the WPI centers, when they are not included in graduate schools. For MANA, being a non-university institution, it is of particular importance to have a strong tie with universities. This has been achieved by affiliation agreements with several universities including Hokkaido University.

At the same time, environments to stimulate young researchers are very important. MANA adopts a double-mentor, double-affiliation, double-discipline system for young scientists. IPMU encourages its postdocs to do research at overseas institutes for a certain period of time each year.

3. Fusion of Researches

The WPI Program expects the WPI centers to create breakthroughs or paradigm shifts in their current research and in opening up new sciences and technologies. Interdisciplinary research and collaboration among diverse research areas are also important steps towards meeting such challenges.

However, fusion studies are in principle unpredictable and can only be achieved through discussions and work among researchers of diverse backgrounds. Therefore, it is important for the center directors to provide opportunities for researchers in diverse fields and with diverse interests to communicate freely. Chances for communication such as seminars and in a casual atmosphere e.g. tea-time as well as space for communication are to be prepared.

AIMR has been attempting fusion studies, but they are still limited at a collaborative level among research groups while a strategy towards a new material science is not yet visible. Furthermore, the center director fails to show enthusiasm for such studies.

IPMU aims to fuse mathematics and physics in understanding of the origin of the universe, which seems promising but needs to further efforts, especially for mathematicians.

iCeMS proposes to integrate cell biology, chemistry and physics under a concept of Meso-Control. However, the follow-up committee pointed out that this concept is not clearly visible and researchers seem to be working independently without a clear strategy towards fusion. In addition, the site-visit team felt that collaboration among researchers of different disciplines ought to be strengthened to better elucidate the mechanisms by which somatic cells are reprogrammed.

IFReC proposes to fuse immunology with molecular imaging. Along this line, Osaka University is making effort to establish an “imaging center”.

MANA proposes application of nanotechnology with environmental science (Nano-green) and with life science (Nano-bio).

4. Implementation to Establish World-Visible Research Centers

To establish a world-visible research center, strong leadership by the center director as well as a clear strategy is obviously indispensable. A role model is IPMU, which is establishing such an institution under the strong and strategic leadership of Dr. Hitoshi Murayama. However, the follow-up committee noted that further effort needs to be made especially by the center directors of AIMR and iCeMS.

Excellence of science is a cornerstone for achieving the global visibility of WPI research centers. On the basis of scientific excellence, the WPI research centers are expected to be genuine world-top research centers in Japan, to which world-leading experts join as PIs and which attract young investigators as a proud step in advancing their career paths.

For this purpose, the following target numbers are called for in the program application guidelines.

- At least 10-20 world-class PIs, at least 10-20% of whom are to be foreign researchers invited from abroad.
- At least 30% of the researchers to be from overseas, including those on short stays.
- A total of at least 200 staff members as a target, including young postdoctoral researchers, research support staffs, and administrative employees.

IPMU and MANA have successfully achieved internationalization of their WPI research centers.

IPMU—young investigators are proudly convinced that they are working for a first–rate international institute. The large number of job applications is another indicator of the world visibility of IPMU.

MANA is successful in recruiting foreign researchers, accounting for 52% among 160 researchers in total. Among postdocs, 84% are foreigners (58/69). A professor of University of Rome has recently joined to MANA with his research team. Internationalization of MANA is in large part aided by NIMS’s previous experience with the MEXT-grant ICYS (International Center for Young Scientists).

The rest of WPI research centers have invited overseas PIs; however, their numbers and overall

quality fall short of meeting the desired levels at this point.

It is certainly difficult to successfully invite established scientists particularly in experimental fields, compared to theoretical sciences. Considering this difficulty and the 10year term of the WPI Program, it may be more realistic and stimulating to recruit excellent junior PIs with great capability in the future, to which a reasonable size space, start-up budget and manpower should be allocated. Further, a tenure-track program ought to be considered by the host institutions.

For recruiting foreign researchers, it is very important to prepare a living environment, e.g. lodging, schools, job opportunity for spouses, and assistance in daily life. Administration staffs of WPI centers are in general carrying out this support well, although some difficulties still remain.

iCeMS has a fundamental problem in its relationship with CiRA, which was established to study iPS cells at Kyoto University with strong financial support by the government. It is understood that the basic mechanisms of iPS are studied at CiRA as an affiliated division of iCeMS, while clinical applications will be done independently by CiRA. However, the follow-up committee pointed out that a clear strategy to integrate the basic parts of the iPS study into an iCeMS-CiRA framework is needed.

All five WPI Centers have organized international symposia every year, through which they have been establishing their global presence as a WPI center. In addition to ordinary international symposia, organization of international summer courses for students and sponsored symposia on the occasion of world leading meetings would increase the international visibility and also help to recruit excellent young researchers. Good example is that IFReC plans to hold an international symposium during the 2009 meeting of American Association of Immunology.

5. Break of Administration Limitation

Establishing new administration systems is another task of the WPI Program. Existing university administrative procedures and other bureaucratic obstacles need to be overcome. Newly implemented systems are expected to be more flexible and to include such components as strong leadership by the directors, top-down decision-making and merit-based pay schemes. A good example of progress in this direction is Dr. Murayama, IPMU director, who is enthusiastically working to create a streamlined administrative system. Most of the centers either have adopted or plan to adopt merit-based incentive or payment schemes.

The administrative director is also a very important position within the WPI centers. They are expected to assist center directors to allow them enough time to pursue science most efficiently. All the centers have employed persons with research experience as the head of their administrative office.

At present as in the past, Japan's administration systems are carried out exclusively in the Japanese language, while administration people are generally not trained in English. The WPI Program, however, expects institutions to establish English as the primary language for work-related communication. All the WPI research centers are successfully making this change in their administrations by hiring English-speaking persons. Language support is being well arranged especially at MANA and IPMU, where all information is provided bilingually.

6. Improvement needed

Although the five WPI research centers have been making consistent efforts, further improvement is still needed to meet the WPI program objectives. Points that need improvement are stated at the end of each summary report, as shown below.

D. Summary of Comments Made by Follow-up Committee Members

(Comments are shown in italic)

D-1 AIMR:

1. Achievements of Science

Excellent science, but clear identity is needed as a project under the WPI Program.

- *Quality of science is high in this group, publishing good papers continuously.*
- *Overall appears to have made good progress.*
- *Interesting scientific results are already obtained, but the most of achievements seem depending on pre-WPI activities.*
- *Need to establish a clear goal (scientific and technological achievements) for this center in 10 years. Otherwise, they will continue their general and broad research on materials. They may accomplish some nice research results but it can be done in a normal research institute like "Kinken" itself. They do not need to be WPI research center.*
- *Scientific quality is fine. But what is AIMR? The effect of creating a new institute is unclear. Just a formal collection of scientist without any synergistic consequence.*

Strategy for fusion and creation of new material science is not visible.

- *AIMR needs to state more clearly its plan for achieving a distinctive new approach through interdisciplinary collaboration. The four major areas seem rather independent of each other.*
- *Strategy towards new materials not visible.*
- *The key scientific concern however appears to be that the center has not really created a new field of research.*

2. Implementation as a WPI Research Center

The program committee expresses concern regarding the participation of the president of the host institution in the WPI Program.

- *There is a critical difficulty in the leadership commitment of the host university to this WPI project. Because Dr. Inoue serves both as university president and the PI of the WPI project, there is an inherent conflict of interest in the execution of the project.*
- *Excellent overall status today. However, for this center to become a long-term presence of global-level excellence, the governance issue must be addressed as soon as possible. Unless this is done, the center faces an unavoidable possibility of losing its direction and organizational effectiveness soon.*
- *AIMR needs more independence from central administration in order to introduce novel administration elements, such as more flexible salary structures, and create a transformation in decision-making.*

The program committee expresses concern also regarding the leadership of center director.

- *Collaboration among different areas needs to be improved. Some doubt has been expressed about commitment of leadership towards collaborative research. The new Integration Laboratory will help but it is not enough. Center director should make strong commitment and take strong steps to ensure a strong interdisciplinary culture. Without such collaboration, WPI Program is not achieving the desired impact.*
- *Unfortunately the director did not really discuss the research extensively, giving the impression that management was the only focus of his time.*
- *There is a sense that the center director is not really pursuing innovative directions to enable the center to break from tradition and to achieve the aims of WPI Program – example, the issue of recruiting international PhD students.*
- *The center director's focus appears to be only on getting quality research and not the other aims of WPI Program – this will be a key concern for this center going forward.*
- *The center director should exhibit more leadership to make the AIMR visible.*
- *Global visibility has not progressed at the level expected by the WPI Program. Leadership needs to develop energetic strategy for publicizing the AIMR, and for developing other mechanisms to establish AIMR as global leader. This includes energetic recruiting of PIs and international visitors, hosting of workshops, and developing relationships abroad.*

Further efforts are needed in recruiting young and female researchers.

- *The promotion of women and young researchers is insufficient at present.*
- *Very poor progress in recruiting women scientists.*

3. Points that need improvement:

According to the above comments as well as the site-visit report, the following points should be considered to meet the WPI Program objectives:

1. Identification as the WPI research center
2. Clear strategy for fusion studies

3. Accountability for participation of the president of the host institution as a PI
4. Strategy for collaboration with oversea satellite institutions
5. Strong leadership of center director.

D-2 IPMU:

1. Achievements of Science

IPMU is becoming an internationally visible WPI research center within a short period of time.

- *This center has several outstanding characteristics:*
  1. *It has a new and distinctive, interdisciplinary approach that exemplifies the spirit of WPI Program extremely well.*
  2. *The center has made outstanding progress toward gaining worldwide visibility.*
  3. *The tea-times, required presentations for non-experts, seminars, etc. represent a great approach to creating a distinctive organizational culture*
- *Excellent. center director succeeded in recruiting world-top scientists from all over the world. Quality of scientific research is excellent. The activities are becoming visible in general public as well. IPMU is expected to be a role model in the whole WPI Program.*

Collaboration between mathematics and physics seems promising, but needs strategic approach.

- *We have had many remarkable results from the interaction between physics and mathematics, in the course of the string theory, in particular. The goal of IPMU aiming at fusion of both fields seems promising.*
- *Central issue is developing meaningful collaborative research between mathematicians and physicists. They should focus creative energy to secure a highly collaborative attitude among PIs at all levels.*
- *Another problem is cooperation with mathematicians and some strategic approach seems necessary.*
- *How many papers published are the product of working together by PIs from different disciplines?*

2. Implementation as a WPI Research Center

Leadership of center director is highly evaluated.

- *Overall, excellent progress being made since WPI project started. Strong and effective leadership rendered by the center director (best of all 5 WPIs) and a very proactive relationship between the center director and the host university president.*
- *Excellent progress led by the center director, Dr. Murayama. The progress had been more or less made possible by the vision, strategic thinking and skills of the director. His global science network with his own credibility by his global peers has been critical in making progress within such a short span of time from scratch.*
- *It is overcoming the difficulties which come from traditional administration.*

The program committee expresses concern about a lack of tenured positions.

- *Problem of not having tenured persons is well recognized by the center director and by the university president as well. However, this is probably the most critical systemic challenge for all WPI projects in becoming truly global centers of scientific excellence for an extended period of time.*
- *Challenge to attract non-Japanese scientists – tenure is a great concern – there is a need to address how to work between the host institution and IPMU on recruitment so that indeed tenure issue can be considered upfront. This will go a long way to reducing the uncertainty for IPMU recruits, especially the international ones.*

Careful consideration in recruiting retired professors and Ken-nin (double appointment) researchers is suggested.

- *It seems that they depend on retired persons in recruiting fulltime PIs. It is desirable to overcome this.*
- *Ken-nin is a real issue – commitment of Ken-nin is key, perhaps not Ken-nin as a concept in itself– need to review each Ken-nin to ensure that they are indeed contributing.*

Education of graduate students is another issue to be solved.

- *Increasing graduate students is an important issue for IPMU, probably because PIs do not have appointment in graduate schools.*
- *Unable to access graduate students – need to address this jointly with the University of Tokyo and also best to start with the University of Tokyo students first.*
- *I wonder if the interaction with other related faculties in the University of Tokyo is good enough to give great influence to the traditional management style and research and educational activities in the University of Tokyo. If it is good, maybe no problem, but if not, the members of, say, faculty of physics and math should have good relationship with WPI PIs, including students.*

More efforts needed in recruiting women researchers.

- *Greater effort to recruit women scientists is needed and also for true interdisciplinary work.*

Long term strategy of IPMU discussed.

- *It is not too early for IPMU to consider how to establish itself as a permanent institute after the term of the WPI Program.*
- *It is recommended to ensure the future status of IPMU beyond 10 years by university management.*
- *IPMU leadership must develop clear long-term strategy for IPMU following the end of WPI Program in ten years, hopefully with the help of MEXT and the University of Tokyo leadership.*

- *Present success of IPMU may be fragile, if present structure of the teams is changed.*

Other comments:

- *The thought of creating an independent foundation to support this WPI project is a very good one, and worth trying. Again, the commitment of support of the University of Tokyo.*

3. Points that need improvement:

According to the above comments as well as the site-visit report, the following points should be considered to meet the WPI Program objectives:

1. Fruitful collaboration between mathematics and physics
2. Support of the host institution for tenured positions and graduate student issues
3. Continuous leadership of center director to establish IPMU as a permanent institute.

D-3 iCeMS:

1. Achievements of Science

Science of iCeMS, especially the work of Dr. Yamanaka on iPS cells is highly evaluated.

- *Clearly, iCeMS includes top-rank scientists doing top-quality work.*
- *Yamanaka's outstanding achievement made the new institute highly visible*.
- *There is a strong team of scientists especially Dr. Yamanaka and Dr. Kitagawa.*

However, the proposal of iCeMS, i.e. integration of chemistry, physics and cell biology under the conception of "meso-control" is not clearly articulated yet.

- *The integration of the various approaches is unclear. The definition and management (ie leadership of the process) of the focused program is unclear.*
- *It is difficult to identify the three parts of the research program and see their specific achievements up to now.*
- *Research in chemistry is fine but its contribution to the overall project is unclear.*

Overall strategy and goals of iCeMS are not clear.

- *Very exciting work and lots of progress. However, it is a bit confusing to know the overall mission and goals of this huge effort by Kyoto University.*
- *The project still lacks a clear strategic plan that includes milestones and metrics that will unify iCeMS around its research themes. How does the current year fit into the big picture of the overall plan?*
- *From the beginning, the scheme of this project may have contained some elements which are a kind of misleading. It may be difficult to see an example of "fusion".*

2. Implementation as a WPI Research Center

A most important issue of concern by the committee is relationship between iCeMS and CiRA.

- *One fundamental issue that needs to be addressed is that of the relationship between iCeMS and CiRA – how to draw synergy between the two centers.*
- *It is difficult to see how Prof. Yamanaka can be simultaneously trying to promote and position CiRA internationally as well as that of iCeMS – this is particularly in view of the world wide interest in stem cell research and the rapid growth that is expected in this field in the coming years.*
- *The relationship of CiRA within iCeMS is problematic. The problem is a difficult one. iCeMS, CiRA, and Kyoto University leaders should continue to search for answers, and should consider strong measures to nurture strong collaborations and integration of iPS cell researchers with other groups.*
- *iCeMS began with a fortuitous breakthrough by Prof. Yamanaka, which has led to the establishment of CiRA as a wholly-contained group within iCeMS that is using 1/3 of the WPI grant. In order for WPI's program objectives to be met, CiRA must be integrated into the larger theme of meso-control.*

Strong leadership of the center director and also of the president of the university is needed to solve the above problems.

- *Relationship between iCeMS and CiRA should be reviewed and rearranged, if necessary, to make much tighter collaboration. I expect leadership of center director and university president.*
- *A clear and transparent framework for decision-making needs to be established. This should address the relationship between iCeMS and the university and also between CiRA and iCeMS.*
- *We need some sort of assurance that the current involvement and commitment by the university president is more systemic/organizational than personal. A stronger overall grasp of the program—now and for the future—by the center director seems necessary.*

Further efforts for internationalization are needed.

- *The extent of internationalization is not enough.*
- *In general, internationalization likewise seems to be a weak priority.*

3. Points that need improvement:

According to the above comments as well as the site-visit report, the following points should be considered to meet the WPI Program objectives:

1. Reappraisal of the proposed framework and overall strategy
2. Integration of basic studies of iPS as a core research subject into iCeMS under clear relationship with CiRA
3. Internationalization
4. Strong leadership of the center director and the president of the university.

D-4 IFReC:

1. Achievements of Science

Fusion of immunology and imaging is positively evaluated:

- *Very interesting work and excellent progress is being made. The fusion of imaging and immunology being done is impressive and the awards given the scientists are laudable.*
- *WPI Program brings strong expectations for collaborative research. IFReC should develop additional measures to develop culture strongly committed to collaborative research, especially to bring the imaging and immunology groups closer together. It is the excitement of marrying these two fields that secured WPI funding.*
- *The group has been making steady progress in many aspects; strong collaboration with imaging groups within Osaka University, provision of support in preparing infrastructure as Osaka University on the whole, recruitment of overseas researchers and so forth.*

At the same time, some problems of fusion with imaging are pointed out:

- *Quality of research is very high. "Fusion" of research is in progress. However, the synergistic effect by founding this new institute is not clear.*
- *The fusion of immunology and imaging is very difficult, because immunologists use imaging for research and because imaging researchers may become slaves. They may need some strategies to promote super science between immunology and imaging.*
- *I am a bit concerned that informatics and imaging may be viewed primarily as providers of technology services to the immunologists, rather than as partners in the establishment of a fundamentally new approach to the topic areas. The imaging and informatics PIs and other researchers in these areas need to have an impact back on their primary fields.*
- *I was originally very impressed with the plans to integrate immunology with imaging in particular. The reports do not give the impression that this is happening at the level of defining research challenges and problems. I am afraid it will even be reduced to the purchase of commercial imaging microscopes.*
- *Excellent progress, but the collaboration or ways to take advantages of the project originally outlined in the application between immunology and imaging (which is a technology) are not clear and not effectively implemented.*

Importance of the fields of genomics and structural biology is suggested:

- *Greater attention to genome sequencing and structural biology is needed. If these disciplines are not included, the work will not be truly interdisciplinary. Also opportunities for major new discoveries will be lost.*
- *Genomics is a major area that needs to be included in the research effort.*

2. Implementation as a WPI Research Center

The follow-up committee members pointed out that more efforts are needed for

internationalization.

- *WPI Program is an opportunity to develop high international profile. It is not clear that IFReC leadership is really taking advantage of this opportunity.*
- *Although efforts are being made to increase overseas researchers in the group, further improvement is needed in this respect.*
- *The project has made a strong start toward internationalization and achieving global recognition. However, it is unclear what sort of a strategic plan underlies the specific activities.*

Recruiting of young researchers and organizing symposia are suggested:

- *Need to inject young researchers both from Japan and also internationally into the center – an important issue to consider is to give more independence to promising young investigators.*
- *Has the WPI project attracted more and more Japanese young scientists and graduate students and fellow from major universities of Japan?*
- *There need to be more aggressive plans for promoting interdisciplinary collaborations, e.g. more joint seminars, informal coffee discussions, and also multidisciplinary public programs. It will be good to invite other groups / departments in Osaka University to participate in many of these programs.*
- *IFReC has strategically positioned itself to be visible internationally and should continue to invest in this effort – including co-hosting a symposium in Singapore.*
- *New partnership with Pohang University of Science and Technology (Postech) and Institute for Systems Biology (ISB) is a way to show visibility of the new center.*

3. Points that need improvement:

According to the above comments as well as the site-visit report, the following points should be considered to meet the WPI Program objectives:

1. Breakthrough in both immunology and imaging by fusion of the two disciplines
2. Inclusion of genomics and structural biology
3. Internationalization.

D-5 MANA:

1. Achievements of Science

Research directions became clear by alignment into four research areas, but follow-up committee pointed out that their distinctiveness need to be strengthened.

- *The new research structure and focus provides greater clarity of the research directions and also how the impact will be achieved as well as a way of mapping out where the strengths and weaknesses are in the center.*
- *So far, the program appears on track, but the research agenda seems surprisingly modest. It will be good if MANA takes on some big research task(s) that are easy to understand for non-experts and that will be exciting to the research community as a whole.*

- *MANA needs to develop and highlight a distinctive research theme or approach that will develop a unity of purpose and sense of mission among all participants. The seeds are in the materials presented, but the distinctiveness needs to be highlighted.*

Built-up of researchers in the fields of nano-bio and nano-green is recommended.

- *MANA needs to strengthen nano-green and nano-bio groups. It is important that the MANA leaders address this, yet do so strategically, attracting international top researchers, and women when possible.*

2. Implementation as a WPI Research Center

MANA has been successful in internationalization; recruiting >50% of researchers and >80% of posdocs from abroad.

- *The center has made good efforts in restructuring overall organization. The current ratio of overseas researchers to total number of staff amounts to 52%, which is highly appreciated. The center has been somewhat successful in realizing internationalization.*
- *MANA is also very international as a WPI research center and their achievements should be shared with the other centers.*
- *The activity is international. Center director recruited several full-time PIs and many posdocs from abroad and has extensive collaborations with some US and European satellites. MANA's management is the best among the five WPI research centers. The overall status is satisfactory.*
- *MANA has done a great job in developing international contacts and in bringing in international researchers. The program with the satellites is impressive. It also appears that MANA and NIMS have listened carefully to previous feedback and are making sincere efforts to improve on weak points.*

Some advice is given on hiring of foreign, young and female scientists.

- *Although the center has been successful in internationalizing the organization, it is slightly biased towards Asia. This direction has to be improved so that the organization is able to have inputs from US and European countries.*
- *MANA needs to reshape its international profile so that there is more representation of international researchers from beyond Asia – this is a big challenge but it is one issue where the insights and lessons learnt by MANA will be enormously useful for the other WPI centers and also the institutions in Japan.*
- *More exchange of scientists, young and old, even for a short period, with programs abroad. This will create and be critical to building future networks for collaboration and global leadership.*
- *MANA should be commended for focusing on promoting independent research among the young scientists as well as giving them international exposure.*
- *Better progress in recruiting women scientists, especially from overseas. This is an area where*

more females are interested and good female scientists could be recruited.

Questions are posed as to relationship between NIMS and MANA.

- *Research performance is excellent. However, MANA is still a part of NIMS, and not an independent WPI research center.*
- *Important point is: What is the relationship between MANA and NIMS. Then, the way of operation of MANA is to be different from that of NIMS. MANA is to be managed as flexibly as possible.*
- *It is strongly expected to open up a new way for Japanese governmental (independent administrative body) research organizations.*

Collaboration with universities is also an important issue for MANA.

- *Since NIMS is not a university, MANA should place special effort into bringing in (graduate) students in various ways. One not mentioned was (short-term) internships. The efforts to hold conferences at universities are good, and the special relationships with Waseda University, Tokyo University of Science, etc., are good efforts. I would recommend adding some open programs to which other universities and overseas students could also apply. This kind of program may help create excitement around the activities at MANA.*
- *It seems to me that collaboration with top Japanese universities is not enough. This point has to be taken into consideration in future.*

3. Points that need improvement:

According to the above comments as well as the site-visit report, the following points should be considered to meet the WPI Program objectives:

1. Making clear distinctiveness of science being pursued in MANA, if any
2. Reinforcement of nano-green and nano–bio fields
3. Collaboration with universities
4. Strategy for collaboration with oversea satellite institutions.