

Center Director's Vision

Statement of my View for the Proposed “Institute for Integrated Cell-Material Sciences” a World Premier International Research Center

Center Director

Norio Nakatsuji, Ph. D.

Professor and Director

Institute for Integrated Cell-Material Sciences

Kyoto University

Forewords

This proposal is a response to the Japanese government initiative to found world-premier international research centers, (1) to explore interdisciplinary research fields, and (2) to place themselves within the global career-development flow of top scientists in their own generations.

To address the first point, “to explore interdisciplinary field”, the proposed institute aims to attain a critical mass of leading scientists for **the creation of a new research field, “the Integrated Cell-Material Sciences”**. This is based on the notion that **the fundamental understanding and control of molecular complexes in THE MESO-SPACE OF 10-100 NM is critical for creating the science and technology of the next generation.**

Therefore, MESO-SPACE is one of the two key concepts in this proposal.

Meso-space is greater than the nano-space of 1-10 nm, which nanotechnology and molecular biology have extensively explored. It is smaller than the bulk space greater than 1 micron, where there are sufficient numbers of molecules for ensemble averaging. Between these two well-traveled lands, there is the vast unexplored land of meso-space of 10-100 nm. Although molecular, atomic, and

ionic interactions occurring in nano-space are interesting subject of research, they are generally elementary processes. Non-linear, weakly-cooperative events, which present challenging problems and can be the seeds for the tomorrow's technology, take place in meso-space.

Using the notion of meso-space, the biological and non-biological worlds can be united to learn from each other, and to elucidate the physical and chemical processes characteristic of meso-space, including the formation and functional mechanisms of the meso-scale molecular complexes in the cell. As detailed in the later sections of this statement, we envisage that such a study would develop a new realm of science and technology, in the cross-disciplinary field of biosciences, physics, chemistry, and materials science.

The second key concept is the STEM CELL. Since we will be a group of investigators with a variety of backgrounds, standardized paradigm for studying the cell must be established. This is indispensable for fostering collaborative research, by enhancing the ease of sharing knowledge on cells, biological tools, samples, and communication among researchers working in different fields in this Institute. For this purpose, all of the PIs will use pluripotent stem cells, either embryonic or artificially-induced (one of the PIs for this proposal, Dr. Shinya Yamanaka, was the first to produce such a cell line; Cell 2006, Nature 2007). These cells grow rapidly (1000-fold within a week for mouse ES cells); their genes can be manipulated easily, and then with the same manipulated genes, they can be differentiated into various cell lineages. Therefore, using pluripotent stem cells for the research would accelerate the development of regenerative treatments.

To address the second point of this government initiative, "to place itself within the global career-development flow of young scientists", I would like to express my strong personal belief in Japanese science. The most critical

problem with Japanese science is its exclusion from the global career-development flow of young scientists. Without attracting the best and brightest young researchers to Japan, and having some of them stay in Japan, Japanese science would lag behind that in other developed countries. This problem could be much more serious problem than the one about years of government underspending on scientific research.

In the first sentence of the call for the application, from the Program Committee of the World Premier International Research Center (WPI) Initiative, it was stated as “we will need to position ourselves within the global flow of outstanding human resources while creating research platforms that will naturally attract and amass such human resources in Japan.” This is exactly what I have been considering for a long time, and because of this statement, I have decided to contribute to this proposed Institute and to commit as the Center Director.

Therefore, **I have organized this Statement of my View for this proposed Institute IN AN UNUSUAL WAY**. Although I am strongly confident that scientific content of our proposal is outstanding, and would appeal to bright young scientists around the world, I would like to begin this statement by explaining the administrative programs, systems, and reforms that will take place in this Institute. In addition to the science conducted in this Institute, these new programs and reforms would make this Institute more attractive to the foreign researchers, and make scientists from abroad free from general stumbling blocks of cumbersome administrative procedures, worry for the start-up fund, and linguistic barriers. I will also explain how this proposed Institute could work as a beach head to revolutionize the administration archetype of Japanese Universities.

I. Administration Programs and Goals

We will run the proposed Institute as a future-model-institute at Kyoto University and in Japan. In the organizational structure of Kyoto University, this Institute will occupy a special position, freed from many binding rules of archetypical Japanese universities, and flexible management rules will be introduced, as described below. It will have minimal hierarchical layers so that information flow and decision making processes will be facilitated, both in the administration offices and in the laboratories. These rules will be applied for the foundation of other research institutes within Kyoto University in the future. Although the Center Director will report directly to the President of Kyoto University and the Executive Board Member in charge of research and education, the Institute's autonomy and the Center Director's leadership in making decisions on the overall operation of the Institute will still be ensured.

[1] Compliance with all of the recommendations made by this government initiative

I totally agree with the recommendations made by the program committee for this government initiative. Therefore, all the recommendations will be entirely implemented in our Institute, at much higher levels than those anticipated by the committee. Here is the list. (For the reviewers from abroad, the emphasis on these points may sound strange, because these points might be quite usual to them, but these are all new to the Japanese university system, and some of them are totally unheard of in Japanese universities.)

1. English will be used on all occasions, in all of the meetings and documents, including e-mail announcements. Two members in each section of the administrative office will be fluent in English. However, what will happen if the researchers cannot communicate with the lab technicians in the lab? Importantly, in the international and academic environment of the city of Kyoto, the

concentration of laboratory technicians who can communicate well in English is very high. Quite a few technicians have had the experience of working outside of Japan as laboratory technicians. In many cases, they are married to Japanese researchers, who worked in overseas laboratories, and they also chose to work there. Many laboratory technicians working at Kyoto University have Master of Science degrees.

2. Swift decisions will be made by the Center director. Major decisions, including the level of the Institute's support (funding) and the space allocation for each PI, will be made by the Center Director with the aid of the executive board of the Institute, consisting of the Center Director, the Deputy Center-Director, and the Administration Director.

3. Steering and evaluation committees, consisting of a group of learned individuals from both outside and within the University, will be established.

4. A merit-based salary system will be introduced. The salaries of the investigators transferred within Kyoto University will be paid directly by Kyoto University, according to its rules. However, merit-based compensation, in the form of a bonus, will be introduced. In parallel, a total merit-based annual salary system will be implemented for researchers relocating from outside the host institution. Rigorous, objective evaluations will be conducted by the Evaluation Committee. Based on the report from the Evaluation Committee, the final evaluation will be given by the Center Director, with the help of the Center Executive Board and the Steering Committee.

5. All positions will be disclosed and advertised internationally.

6. The principal investigators (PIs) are professors of Kyoto University, but will be freed from all of the duties for various committees and undergraduate education.

7. International Symposia to promote the Integrated Cell-Material Sciences will be held at least twice a year, inviting world leaders from related fields.

8. To minimize the researchers' administrative workload, the administration

office will be adequately staffed with qualified personnel.

9. Start-up funds for researchers from other institutions will be guaranteed by the Institute and Kyoto University.

[2] Special programs instituted in the proposed Institute

Given the geographical, linguistic, and cultural barriers of Japan, even the best institutions in Japan carrying out top-level research may have difficulty attracting scientists from abroad to work at their institutions. To improve this situation, the Institute will additionally implement the following programs and strategies.

[2A] A career-development superpostdoc system: Kyoto iCeMS Fellow Award

We will create a **career-development superpostdoc system**, called “Kyoto Integrated Cell-Material Sciences Fellow” or “**Kyoto iCeMS Fellow**” at a cost of 2.6-million-USD/year. This is a program to provide great resources, autonomy, and accountability for talented young researchers for their scientific development. They will have free access to equipment and facilities in affiliated departments, as well as in any PI’s laboratory and the shared-instrumentation laboratory in the Institute. Therefore, with this budget, we will have about 8 Fellows working in our Institute at any one time. Candidates will be selected from the international pool of excellent scientists who have recently acquired their doctoral degrees. This career phase is the prime period for ambitious scientific challenges based on fresh and original ideas. The successful applicants will be awarded 5 years of salary (70-100 k USD/year), together with funds to run small, independent research groups (100-300 k USD/year for supplies, technician’s salary etc.). They will also have opportunities to supervise graduate students. Since these excellent young scientists will eventually move on to the next phase of their

illustrious international careers, the Institute's role and reputation as a prominent global scientific center will be widely acknowledged.

[2B] The Institute funds set aside for supporting long-term and short-term visiting scientists and graduate students

Apart from the funds for international symposia held twice a year, we set aside half million USD (60 million Japanese yen) per year for inviting long-term and short-term visiting scientists and graduate students.

[2C] Common-use laboratories

Physical distance among research groups will be reduced to encourage interactions and collaborations on daily basis, which would eventually contribute to making major scientific breakthroughs. To enhance the communication among researchers, the Institute will provide common-use laboratories with bench space allocated among all of the research groups, including groups led by Super-Postdocs or Kyoto iCeMS Fellows. Moreover, the additional space at common-use laboratories will allow flexibility to meet the changing needs and size of each group. The space allocation to each PI will be merit-based, and this could be instituted more easily with such flexible allocation in the common-use laboratories.

[2D] Model mentor development program

The importance of finding a mentor early in the career for scientists is very well known, but the necessity for cultivating competent mentors is rarely discussed. Though it may be true that the greatest mentors are born with qualities, but the skills of professors and PIs for mentoring could be greatly improved by proper education.

We plan to set up an educational program in the Institute, inviting world

prominent scientists who are working in the fields related to the Integrated Cell-Material Sciences and are known to be excellent mentors. The main feature here is to invite their previous students and postdocs at the same time. This would provide interesting opportunities to learn about mentorship while participating in interesting scientific sessions. The mentoring session will be open to any of the scientists and professors in Japan and more.

[2E] Model Scientific integrity and communication program

Although science and technology have greatly contributed to the advancement of human health and welfare, we are also aware of society's concerns for the inadequate progress of science and technology. Some of these concerns may be groundless, but might have been inspired by the words and deeds of the scientists who lack scientific integrity.

Another reason for the public concern may be due to the lack of communication from the scientists' side, to provide informed lay individuals adequate and balanced information about science and technology.

We will initiate a program to educate scientists on scientific integrity and ways to communicate with society, in collaboration with Assoc. Prof. Kazuto Kato from the Institute for Research in Humanities at Kyoto University. He was originally trained as a developmental biologist (Ph.D. from Kyoto University), and after completing postdoctoral research, he started working on the subjects of science communication and ethics. He will help us and we start this program by first inviting prominent scholars in this field, journalists, and other informed individuals interested in these aspects of science. This Institute, with its cross-disciplinary scientific capabilities, will be an ideal institution as an advocate to speak for scientific integrity as well as to enhance communication with society.