

Summary of Proposal

Host institution name	Kyoto University
Head of host institution	Kazuo Oike, President of Kyoto University
Prospective center director	Norio Nakatsuji, Ph. D.
Prospective administrative director	Wataru Soga
Title of center project	Institute for Integrated Cell-Material Sciences
Center name	Institute for Integrated Cell-Material Sciences
Project Summary	<p>This proposal is a response to the government initiative to found world-premier research institutes to explore <i>interdisciplinary fields</i>, which will be placed within the <i>global career-development flow</i> of young scientists. We will accumulate a <i>critical mass of leading scientists for the symbiotic integration of material and cell sciences</i> (focusing on mouse, monkey, and human pluripotent stem cells), based on the notion that <i>the fundamental understanding and control of molecular complexes in the meso-scale of 10-100 nm is critical for creating the science and technology of the next generation</i>. We will achieve this goal by taking cross-disciplinary approaches, with the following inter-related targets. For basic science:</p> <p>1) Chemistry in nano-meso space in aqueous media; 2) Cellular meso-biophysics; and 3) Stem-cell-differentiation meso-engineering. We will contribute to human wellness by developing A) environmentally-friendly chemical reaction systems, B) drug-synthesis/controlled-release microvessels working in the body, and C) regenerative medicine based on regulated cell-material complexes.</p>
Research fields	<p>An interdisciplinary research field, spanning Biosciences, Chemistry, Material Sciences, and Physics (selected from the provided list of fields).</p> <p>The scientific direction of this proposed Institute was conceived based on TWO KEY CONCEPTS. They are MESO-SPACE and STEM CELLS.</p> <p>(1) Meso-space is the space of 10-100 nm. Between the two well-walked lands of bulk- and nano-spaces, there is the vast unexplored field of meso-space. However, we can find fledgling developments there in various branches of science. The cooperative structural changes of porous coordination polymers present good examples. Many key functions of the cell, such as transcription (mRNA synthesis using a DNA template) and signaling, are achieved by large molecular complexes of 10-100 nm, rather than simple bimolecular collisions. In this Institute, we will develop a fundamental understanding and control of <i>the key molecular (weakly cooperative) interactions occurring in the meso-space, throughout cellular, chemical, physical, and materials sciences</i>. By taking interdisciplinary approaches, we will establish a unified view of the molecular interactions in the meso-space in all of these fields, and will develop a variety of unprecedented technologies based on the meso-scale interactions.</p> <p>(2) Mouse, monkey, and human pluripotent STEM CELLS will be used as an important paradigm of the cell throughout the research in this Institute. A unified cellular paradigm is critical for fostering the collaborative</p>

	<p>research by investigators with various backgrounds. This would enable the application to regenerative medicine using human embryonic stem (ES) cells.</p> <p>Kyoto University has been known worldwide for its excellence in both material and cell sciences. Physics and chemistry-related departments have produced four Nobel Laureates, and the times cited for Chemistry of Kyoto University was fourth in the world and first in Japan in 2006. Its Institute for Frontier Medical Sciences is a strong world leader in pluripotent stem cell research. Many faculty members of Kyoto University are active leaders in the forefront of such scientific integration, and thus will enable a critical mass of researchers to establish an ideal research environment.</p>
Research objectives	The same as those described in the “Project Summary” and “Research fields”
Outline of management	<p>i) Composition of administrative staff (Sentences in blue represent those in the formats) The Administration Director and the Associate Administration Director, together with administrative staff (27 members), will be hired. They together should have an experience in international scientific collaboration, as well as the knowledge on administration affairs within the Japanese national university setting. There will be six administrative sections in charge of Personnel and General Matters, Planning, Business, Intellectual Property, Public Relations and Industry Liaison, and Research Ethics and Safety. All sections will have at least two members with a good command of English.</p> <p>ii) Decision-making system The Center Director is responsible for all aspects of the Institute, with the aid of the Deputy-Center Director and the Administration Director. A steering committee, consisting of both scientists and non-scientists from within and outside Kyoto University, has the authority to advise the Center Director. They will meet twice a year on a regular basis as well as upon the Center Director’s request. Scientific advice will be given by the core committee, which consists of all of the Principal Investigators (see the next box).</p> <p>iii) Allocation of authority between the Institute and the host institution In the organizational structure of Kyoto University, this Institute will occupy a special position, freed from binding rules of the classical Japanese university archetype, to present a futuristic model of a highly authorized research institute, not only to Kyoto University but also throughout Japan and the world. For this purpose, flexible rules of a new paradigm, as for the relationships with the university headquarters, will be created. The reforms include merit-based salary, reduced duties for various committees and undergraduate education. These rules will be applied for any other foundation of 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 will basically be run autonomously.</p>
Researchers and other center staffs	<p>Twenty (20) Principal Investigators (PIs) (including three from abroad and one located at a satellite location) Total of 135 Investigators (including 40 investigators from abroad) Total of 250 members (as of 2009.4) Principal Investigators (20) From Kyoto University (13) Norio Nakatsuji, Center Director (Institute for Frontier Medical Sciences, Stem-Cell Biology, 57) Susumu Kitagawa, Co-Center Director (Graduate School of Engineering, Inorganic Chemistry, 56) Motonari Uesugi (Institute for Chemical Research, Chemical Biology, 40) Koichiro Tanaka (Graduate School of Science, Terahertz Optical Physics, 44) Shinya Yamanaka (Institute for Frontier Medical Sciences, Stem-Cell Biology, 45) Hiroshi Imahori (Graduate School of Engineering, Photochemistry, 46) Hiroshi Sugiyama (Graduate School of Science, Gene Chemistry, 51) Kazumitsu Ueda (Graduate School of Agriculture, Cellular Biochemistry, 53) Akihiro Kusumi (Institute for Frontier Med. Sci., Single-Molecule Nanobiology, 54) Mitsuru Hashida (Graduate School of Pharm. Sci., Drug Delivery/Targeting, 56) Kiyoshi Tomioka (Graduate School of Pharm. Sci., Medicinal Chemistry, 59) Tamio Hayashi (Graduate School of Science, Synthetic Organic Chemistry, 59)</p>

	<p>Mikio Takano (Institute for Chemical Research, Solid-State Chemistry, 63) From other institutes (6 including 3 non-Japanese scientists, 1 Japanese to be announced)</p> <p>Takashi Hiiragi (Max-Planck Institute, Münster, Developmental Biology, 39) Yoshie Harada (Tokyo Metropol. Inst. of Med. Sci., Single-Molecule Physiology, 47) Konstantin Agladze (George Washington University, Biophysics, 51) Yong Chen (Ecole Normale Supérieure, CNRS, Nanotechnology, 50) John Heuser (Washington University, School of Medicine., Biophysics, 65) Principal Investigator at the satellite institute (1: Faculty of Appl. Biol. Sci., Gifu Univ.) Makoto Kiso (Faculty of Appl. Biol. Sci., Gifu University, Bio-Organic Chemistry, 60)</p> <p>#To make this Institute an attractive center that provides a career path for young investigators around the globe, the independent Super Postdoc positions will be offered with an annual salary and a research fund (a type of Career Development Award). These will be independent positions, but an awardee will choose a mentor, from among the PIs, to help him/her out.</p>
Outline of research environment	<p>1) To minimize the administrative workload of the researchers, the administration office will be adequately staffed with qualified workers. 2) Start-up funds for researchers from other institutions will be guaranteed by the Institute and Kyoto University. 3) All positions will be disclosed and advertised internationally. 4) The official language will be English, for both research and administration. 5) Official evaluations for the Institute and the members will be conducted in the years 3, 5, 8, and 10 by an international committee, and the results will be used for determining the salary levels. 6) Kyoto University will provide office and lab spaces, and a research environment suitable for a first-class research institute. 7) International Symposia to promote the Integrated Cell-Material Sciences will be held at least twice a year, inviting world leaders from related fields.</p>
Outline of indicators for evaluating a center's global standing	<p>An evaluation committee consisting of both domestic and international members will evaluate the Institute based on the following five criteria.</p> <p>(1) Have the individual investigators carried out research that could impact the field? (2) Have the individual investigators originally from different disciplines worked collaboratively to produce important results? (3) Has the administration properly supported the investigators, in a manner suitable for a premier international research center? (4) Has the Institute become recognized by researchers around the globe as an excellent place for young investigators to establish their career paths? (5) Has the Institute sufficiently promoted the interactions with researchers from the eastern and Asian countries?</p>
Securing research funding	<p>In addition to the funds from this program, we expect to obtain extramural supports which researchers will procure, and active supports from Kyoto University for institute's expenses.</p>
Summary of host institution's commitment	<p>(1) Kyoto University will provide the Institute with buildings located near the "International Zone of the university", where Institut Franco-Japonais du Kansai, Centro Culturale Italo Giapponese di Kyoto, and Göthe-Institut Kyoto are located, i.e., the buildings that previously housed the Institute for Research in Humanities and the Engineering Bldg. 9, plus the Sub-Center lab at the Institute for Frontier Medical Sciences (animal and ES cell facilities). In addition, the following supports will be provided by Kyoto University.</p> <p>(1) Anti-vibration (earthquake) retrofitting of the buildings and remodeling for the laboratory. (2) Most of the utility bills and building maintenance expenses.</p> <p>(2) Kyoto University will provide at least five principal investigator-class positions. Also, it will cover the salary for the PIs from Kyoto University, as well as necessary means to fill the vacancies within the former departments of PIs. PIs will keep affiliation with their former departments for graduate education.</p> <p>(3) As for the administration, Kyoto University provides the full-time administrative staff and necessary personnel expenses in order to establish an independent administrative organization.</p> <p>(4) Kyoto University will provide the Center Director's discretionary fund.</p>