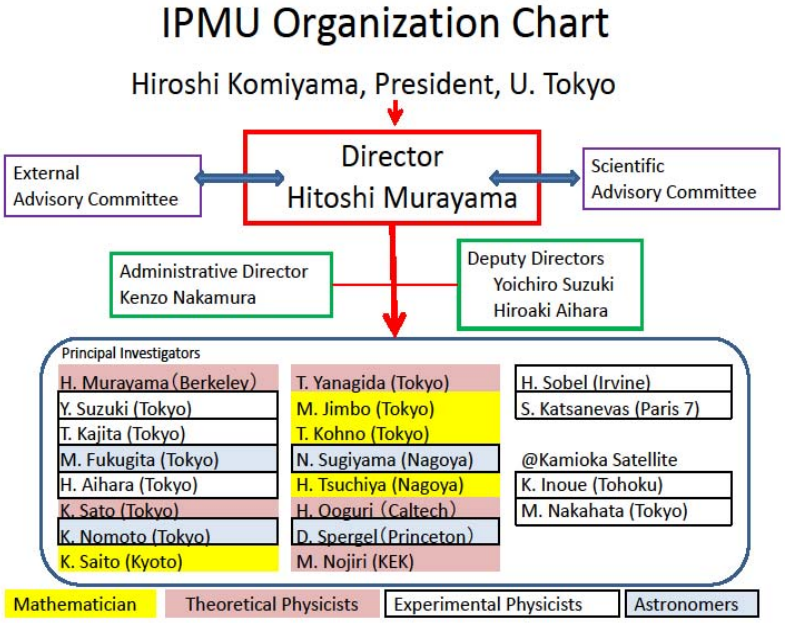
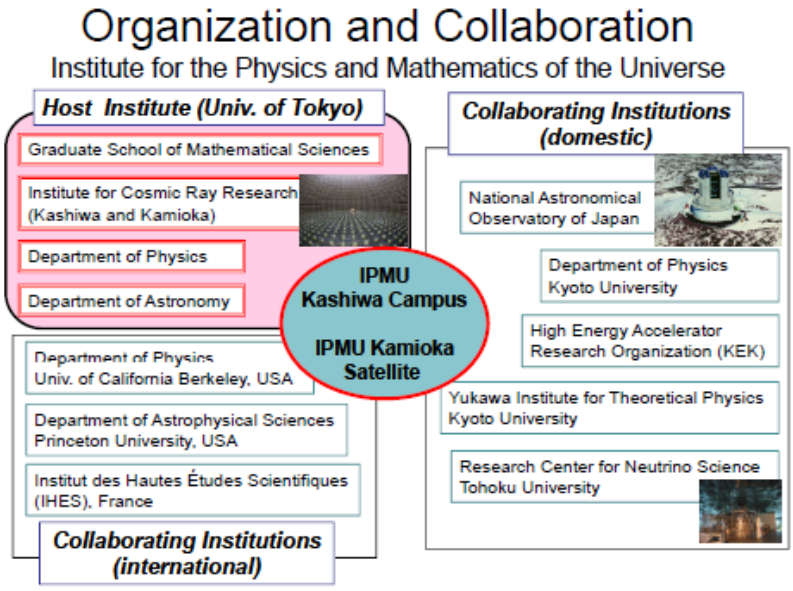
Research Center Project

Host institution name	The University of Tokyo
Head of host institution	Hiroshi Komiyama (President, The University of Tokyo)
Title of center project	Institute for the Physics and Mathematics of the Universe
Center name	Institute for the Physics and Mathematics of the Universe
Project summary	This center aims at establishing a multi-disciplinary research institute with the unifying goal of understanding the universe from the synergistic perspectives of physics, cosmology and mathematics. The institute brings the world's leading theoretical physicists and mathematicians together to develop new formulations of the fundamental laws of nature, a crucial step toward solving the mysteries of the universe. We will develop infinite analysis, the mathematics for systems with infinite dimensional degrees of freedom, which will be used to build new physical theories and derive their experimental predictions and to invent statistical methods to analyze geometric data. We will study dark energy, dark matter, neutrinos, and physics beyond the Standard Model of elementary particle physics. The institute builds on the state-of-the-art facilities (Super-Kamiokande, KamLAND, Subaru telescope, and LHC accelerator) that will produce an unprecedented amount of precision data for observational cosmology, astronomy and elementary particles physics. We aim to develop new mathematical tools to analyze the data by taking full advantage of collaboration between mathematicians and physicists, and will develop new experimental strategies to attack the mysteries. This center is a unique research institute in the world on the forefront of physics, cosmology and mathematics and will lead to a new paradigm of sciences in the 21st century. It will attract highly motivated young researchers, as well as established leading scientists from around the world and will greatly strengthen the foundation of mathematical and physical sciences in Japan. We will also bring topnotch female researchers as role model to inspire women in Japan and promote Asian diversity. ・ Include a chart that illustrates the center's overall structure including its collaborative linkages with other domestic and foreign institutions, its system of external evaluation, and its management framework





(1) Research fields

- Fill in the name of the research field of the project.
- Choose relevant fields from among ①－⑦ below, specifying the inter disciplinary field(s) that the project addresses.
  ①Biosciences, ②Chemistry, ③Material sciences, ④Electronics engineering and information sciences,
  ⑤Precision and mechanical engineering, ⑥Physics, ⑦Mathematics

Physics and Mathematics

- Describe the importance of the proposed research, including domestic and international R&D trends in the field and Japan's advantages.

・ If centers in similar fields already exist in Japan or overseas, please list them.

Science's fundamental and historic search for the fundamental laws of Nature is built on the invention of new mathematics, and it has inspired many important developments in the field. Famous examples include the simultaneous invention of Calculus and Newton's mechanics and the use of Riemannian Geometry in General Relativity. The interface of physics and mathematics is alive and well. Approximately 40% of Fields Medalists in mathematics since 1990 have worked in areas closely related to quantum field theory and string theory. Conformal field theory in two dimensions, whose development was largely motivated by string theory, has been used to explain the remarkable identities about the Monster group (Field Medal to Borcherds) and to describe stochastic geometry (Fields Medal to Werner). Methods of topological string theory have revealed deep connections among the Gromov-Witten invariants, gauge theory instantons, and combinatorics (Fields Medals to Kontsevich and Okounkov). In return, these mathematical developments have provided powerful tools for quantum field theory and string theory.

No other area of science has had such a great impact on mathematics in the past few decades, and the rate of progress in this area suggests that this trend will only accelerate in future. As stressed, for example, in a recent National Research Council report, "Rising Above the Gathering Storm," in the United States, building up strength of mathematical and physical science is a key to lead in a highly competitive world scene of science and technology. Coincidentally, the Science Council of Japan warned recently that Japan's foundation of mathematics is at risk due to not attracting young talented minds into this fundamental field. At the proposed Institute, we will build a community of physicists and mathematicians, redefine the boundaries between them and help nurture future generations of mathematical scientists. Uniquely to this Institute, we anticipate cross-career development between mathematics and physics, such as a statistician moving to experimental physics.

Mathematicians and physicists have very different work styles. Although two PI's for mathematics stay in their current Komaba campus, Tsuchiya and Saito will reside in Kashiwa as Principal Investigators, who facilitate communication between physicists and mathematicians and maintain activities in this area throughout the year. There will be semi-annual workshops that bring mathematicians and physicists together where they will share their common problems. Once that is established, they will keep communicating over phone and video on individual bases, visiting each other on as-needed basis, as well as organized seminars broadcast over the video to maintain mutual interest. We also plan to have a state-of-art video conference system and internet-blackboards between Kashiwa and Komaba that stay on 24/7 to make impromptu discussions possible.

Our advantage of experimental programs is evident. Japan continues to lead the field of underground physics including dark matter search and study of neutrinos by capitalizing on two major underground detectors (Super-Kamiokande and KamLAND) at Kamioka, where a satellite of the Institute will be established. Some principal investigators of the Institute are now building a new instrument that enables a wide-field, deep survey of galaxies at Subaru telescope. The data from this instrument will most likely dominate the field of observational cosmology and astronomy well into the next decade. Scientists in our Institute will have the first-hand access to high quality, high precision data available from these world premier facilities. LHC, the world highest energy accelerator, will become operational by the end of this year and the data of high energy collisions that mimic Big Bang, the birth of the Universe, will be available to us. By bringing together the world-leading mathematicians, theoretical physicists and experimental physicists and taking advantage of the data available at the Institute, we will take on challenges of solving the mysteries of the Universe. This is another reason why most active world-class scientists should come to work at the Institute.

The Institute we will establish is a unique research center in the world that spans pure mathematics, theoretical physics, experimental physics, astronomy, and applied mathematics. This kind of Institute will be truly unique in the world. Kavli Institute for Theoretical Physics is an excellent institution, yet does only theoretical physics. There are many first-rate institutions that combine research in mathematics and theoretical physics, such as Isaac Newton Institute for Mathematical Sciences in Cambridge, Institute for Advanced Study in Princeton, IHES in France, and MSRI in Berkeley, but none of them include experimental physics in their program. There

are also great institutions on both theoretical and experimental physics, such as CERN, Fermilab, SLAC, KEK, but none of them have mathematicians. The combination of science the proposed Institute will include should attract best people from the world because of its uniqueness and potential for major breakthroughs.

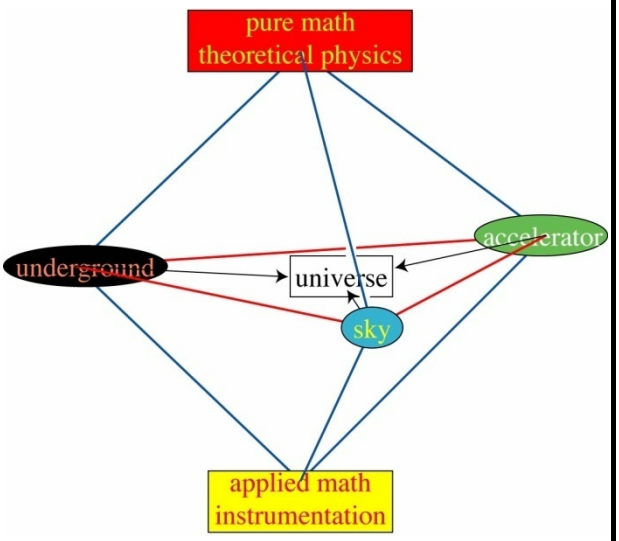
This project is timely and important in that Japan has currently positioned herself to lead this research field and in that this initiative meets demand for Japan to keep a cutting edge in global and competitive Science and Technology environment.

(2) Research objectives

- Describe in a clear and easy-to-understand manner the research objectives that the project seeks to achieve by the end of the grant period (in 10 years). In describing the objectives, the following should be articulated in an easily understandable manner: What new domains are expected to be pioneered by fusing the target fields. In the process, what world-level scientific issues are sought to be resolved. What is the expected impact of the scientific advances to be achieved on society in the future.

- Describe concretely the research plan to achieve the objectives, and any related past achievements by the host institution.

At this Institute we address big questions about the universe, its fundamental laws, its beginning, its fate, and its mysterious components, such as Dark Matter and Dark Energy. For this purpose, we will create new mathematics needed for the unified description of the universe. It will enable new physical theories with testable predictions. Technological innovations follow to make new experiments possible; whose data will further stimulate development in mathematics. This upward spiral will move the science forward, exciting the public at large and motivating students to enter mathematics, science, and engineering to become the next-generation workforce.



Even though it is difficult to accurately predict the possible deliverables from this Institute aimed at basic (not applied) research, here are a few examples of new possible domains we may pioneer on the ten-year time scale:

- Effort by string theorists to enumerate and classify solutions leads to development of new class of geometries.
- New data on dark matter from underground and accelerator experiments of the Institute require new paradigm in particle physics changing the course towards the unified theory in physics, and require new mathematics.
- Mathematical developments in integrable systems allow string theorists to work out new class of solutions that suggest a dynamical behavior of Dark Energy, and prompt new type of observational strategies in spectroscopic galaxy surveys.
- The vast data from the next-generation galaxy surveys nudge the applied mathematicians and statisticians to develop a novel method to extract subtle information from the last data set, uncovering an unanticipated new behavior of Dark Energy.

In all anticipated examples including those above, pure mathematics, theoretical physics, experimental physics underground, astrophysical, and accelerator-based, and instrumentation will motivate each other's efforts in a way not possible in the usual structure of academic institutions where these activities tend to be decoupled from each other. All of these scientific objectives are keenly shared worldwide, and any discoveries at the Institute will have immediate impacts on the global scale.

To ensure this cross-development of this type, we assembled an amazing group of researchers from around the world. They all have a strong track record in working on subjects not confined in their specific research areas, but extend well beyond the boundaries.

The Institute also builds on the strengths of the Japanese science community in many ways. University of Tokyo and Tohoku University lead the world in well-known success in neutrino physics and move to wider scopes of underground experiments such as dark matter searches. The Subaru telescope, the largest field of view among the world 8m class telescopes, will be exploited.

)

There is a long tradition for physicists and mathematics to work together which was especially true in the 90's and can be revamped in the 21st century. There is close relationship between theoretical and experimental particle physicists working on physics beyond the standard model which is unparalleled in the world.

The research plan is mostly about bringing in superb scientists in the relevant areas as termed professors, postdocs, and visitors. All Principal Investigators have a strong track record in securing and managing competitive grants for their research. Focused workshops at the interface of physics, mathematics, and astronomy will bring in worldwide leading scientists to the Institute and breed new directions in the fields and redefine their boundaries. Generous start-up packages and seed money for developing new ideas towards future experiments will bring in competitive grants further. Frequent interactions among the PI's ensure new directions will emerge at the interface of the traditional boundaries of the subfields.

We anticipate big societal impacts of the Institute in the following way. The questions that the proposed Institute addresses are easy to relate to for laypersons. Excitement in the new paradigms in our understanding of the universe spark interest and imagination among young students and more of them enter the fields of mathematics, sciences and engineering to build a stronger future workforce. New experimental initiatives from the Institute will require new technologies in particular in instrumentations, which get transferred to the industry for new purposes. For instance, development in multi-fiber technology needed for future galaxy surveys may well lead to medical applications. It also reverses the tide of brain-drain from Japan not only by bringing back the Japanese researchers who left the country, but also bringing worldwide researchers to Japan because of the attractive research opportunities.

(3) Management

i) Center director

- Fill in the name of the prospective center director, his/her age (as of 1 October 2007), current affiliation and position title, and specialties. Describe his/her qualifications to be the center director.
- Attach a biographical sketch of the prospective center director using Appendix 2.
- How does the prospective center director intend to construct the center and what is his/her vision of objectives to be achieved? Provide a synopsis written by the prospective center director (free format).
- If possible, attach a letter (s) of recommendation for the prospective center director from researchers with world-standard achievements in the subject field.

Hitoshi Murayama (Age of 43),

MacAdams Professor of Physics, University of California, Berkeley,
Department of Physics, and
Faculty Senior Staff, Lawrence Berkeley National Laboratory,
Theoretical Physics

Qualifications to be the center director:

Professor Murayama is one of the world's leading theoretical elementary particle physicists and of an outstanding stature. His research specialty and achievements span from the fundamental mathematical physics to phenomenological physics and to experimental research of neutrino physics. His scientific *breadth* is one of key qualifications to be considered as director. He is highly respected and has been deemed as one of the young leaders in the fundamental science community. Professor Murayama has served on numerous scientific-policy making committees in US, Japan and Europe. His breadth of scientific visions and outstanding communications skills together with his tremendous scientific achievements distinguish him as one of the true leaders in the field. Professor Drell emphasizes that one of the most critical roles of the institute director, in addition to articulating the scientific vision, will be to attract talent and foster a culture of collaboration at the institute. Professor Drell attests that Professor Murayama is one of very few gifted people who have the ability to bring people

together and develop the institute into something greater than the sum of its individuals. Professor Murayama is best qualified to command this new, bold and timely WPI program, "the Institute for the Physics and Mathematics of the Universe."

Professor Murayama will return to the University of Tokyo in January 2008 and will work for the project as its full-time director

ii) Administrative director

・ Fill in the name of the prospective administrative director, his/her age (as of 1 October 2007), current affiliation and position title. Describe his/her qualifications to be the administrative director.
・ Attach a CV of the prospective administrative director (free format).

Kenzo Nakamura (Age of 62)

Professor, Institute of Particle and Nuclear Studies, KEK

Qualifications to be the administrative director:

Professor Nakamura had served as Head of Experimental Planning & Coordination Group at KEK for 1995-1997, and subsequently as Head of Physics Department III of Institute of Particle and Nuclear Studies at KEK for 1997-2006. His experience and excellent administrative skills will be indispensable to start up the administrative organization of the Institute and maintain highly efficient and effective function of the administration. He has extensive experience of how to supervise administrative staff members. Because he is a physicist by training he will be readily integrated to the scientific organization and will be able to work coherently with researchers in the Institute. Professor Nakamura knows and understands what makes a work environment most adequate to researchers. We are extremely pleased and fortunate to have Professor Nakamura as head of the administrative staff.

iii) Composition of administrative staff

・ Concretely describe how the administrative staff is organized.

The administrative staff is an integral part of the Institute. The administrative organization belongs to Directorate that consists of the Director, Deputy Directors and Administrative director. Because this Institute belongs *directly* to the Office of the President (without any other intervening layers of administration), the University has committed to make administration resource at the University headquarter available to the Institute. The Institute directorate will have direct access to the administration office at the University headquarter and will share its resources. With this direct coupling to the Office of the President, we envision our administrative organization will be streamlined, yet very effective to provide the best possible environment to the researchers in the Institute.

On site, we will have, under the administrative director's supervision, offices devoted to 1) general affairs and human resources, 2) financial/budget planning and accounting 3) information and public communication/outreach, and 4) international affairs. Each office consists of a chief officer and a few assistants. These offices will perform day-to-day administrative function and will, whenever necessary, work directly with the directors of the institute. The office of international affairs is particularly important for the institute. It helps our foreign employees and visitors to find houses, international schools for their children, and helps for organizing international conferences and workshops. We hire skilled experts for many sections and plan to fill more than 50% of staff member positions by persons who are bilingual.

iv) Decision-making system

・ Concretely describe the center's decision-making system.

As shown in the organization chart included in the section of Project Summary, except for personnel decisions regarding the center director and principal investigators (PI's), which will be made by the President, the center Director has a complete authority of making a wide range of decisions, including proposing recruitment of PI's to the President, appointing staff researchers,

postdoctoral researchers, research support staff members and administrative employees. The Director will be assisted, whenever needed, by two deputy directors and by the administrative director.

The administrative director conducts administrative business and oversees the staff members who take care of visitors from other Japanese institutions and from abroad. His function enables the Director to spend more time to consider the Institute at large and to focus on the direction of the research. The Director will have direct access to the Office of the President and will be able to consult with the President and his assistant staff members.

The Scientific Advisory Committee (SAC) reporting to the Director consists of four to five PI's of his choice. They advise the Director on planning of hiring staff members as well as scientific directions. The role is strictly advisory. The Director is solely responsible for making the final decisions. The PI's have a large autonomy in the research they conduct and they are encouraged to fund their research through competitive grants. They can make a proposal to the Director to hire postdocs and termed professors to help their research. The Director's approval on the proposed appointments will reflect the scientific vision and priorities set by the Director, who may consult the SAC as needed.

Of particular importance is the External Advisory Board (EAB) who will review annually the scientific achievement and activities of the Institute and advise the Director on the scientific priorities and the research activities to keep the Institute stay on the course of the proposed science. At least half of EAB members consist of scientists from institutes other than the University of Tokyo.

v) Allocation of authority between the center director and the host institution's side

・ Concretely describe how authority is allocated between the center director and the host institution's side.

We have agreement with the Office of the President that except for the appointment of the Director and approval of appointments of PIs, the center Director has the authority to make a wide range of decisions from how to compose and organize the institute to how to operate it.

(4) Researchers and other center staffs

i) The "core" to be established within the host institution

a) Principal Investigators (full professors, associate professors or other researchers of comparable standing)

	numbers		
	At beginning	At end of FY 2007	Final goal (Date: month, year)
Researchers from within the host institution	10	10	10 (Mar,2009)
Foreign researchers invited from abroad	5	5	7 (Mar,2009)
Researchers invited from other Japanese institutions	5	5	5
Total principal investigators	20	20	22 (Mar,2009)

・ Describe the concrete plan to achieve final staffing goal, including steps and timetables.
・ Attach a list of principal investigators who are expected to join the center at the time of the application using Appendix 1. Place an asterisk (*) by names of the investigators considered to be ranked among the world's top researchers. Describe the policy and strategy for inviting the rest of PIs who are to be invited in the future.
・ Attach a biographical sketch of each investigator using Appendix 2.
・ As for the researchers invited from abroad or from other Japanese institutions, attach a letter of intent from each of them to join the center project (free format).

By the end of FY 2008 (Mar, 2009) we plan to recruit two more PI's who work on theoretical

cosmology and/or particle physics phenomenology. Potential candidates have been identified and we will actively pursue the opportunities.

b) Total members

	Numbers		
	At beginning	At end of FY 2007	Final goal (Date: month, year)
Researchers (Number of foreign researchers among them and their percentage)	20 (5, 25%)	66 (Mar,2009) (14, 21%)	195(Mar,2011) (69, 35%)
Principal investigators (Number of foreign researchers among them and their percentage)	20 (5, 25%)	20 (5, 25%)	22 (Mar,2009) (6, 27%)
Other researchers (Number of foreign researchers among them and their percentage)	0	48 (9, 19%)	173(Mar,2011) (63, 36%)
Research support staffs	0	10	20 (Mar,2009)
Administrative staffs	3	10	10
Total number of people who form the “core” of the research center	23	86	225 (Mar, 2011)

・ Describe your concrete plan to achieve the final staffing goal, including steps and timetables.

We plan to hire two or more termed associated professors who work with PI’s in the area of observational and theoretical cosmology by the end of JFY2008.

We have identified as a candidate for the termed professor a mid-career mathematical physicist who is currently a faculty member with a joint appointment between Mathematics and Physics Departments in a major research university abroad. We also plan to make an appointment of a termed associate professor who will lead the analysis of LHC data. Both of the appointments are to be made by the end of JFY2008.

Starting immediately we aggressively solicit postdoctoral fellows. We plan to make 7 appointments in JFY2007 and additional 21 in FY2008. Three administrative staffs will be transferred from the University headquarter to the Institute. Three additional administrative staffs will be hired by the Institute in FY2007.

Therefore, the Institute as a whole, including researchers from collaborating institutions and others, will become an organization consisting of more than 200 researchers.

ii) Collaboration with other institutions

・ If the “core” forms linkages with other institutions, domestic and/or foreign, by establishing satellite functions, fill in the name of the partner institution(s), and describe the role of the satellite functions, personnel composition and structure, and collaborative framework between the host institution and the said partner institutions (e.g., contracts to be concluded, scheme for resource transfer).
・ If some of the principal investigators will be stationed at satellites, attach a list of these principal investigators and the name of their satellite organizations using Appendix 1, and provide a biographical sketch of each using Appendix 2.
・ If the “core” forms organic linkages with other institutions, domestic and/or foreign, without establishing satellite functions, fill in the names of the partner institutions and describe their roles and linkages within the center project.

The institute establishes an IPMU Kamioka satellite to promote closer collaboration with the neutrino group. It locates close to the Super-Kamiokande and KamLAND detectors. It gathers researchers who work on the underground experimental activities such as study of neutrino physics and XMASS, a new dark matter search experiment that has recently been funded. Two PI's, Professor Masayuki Nakahata of University of Tokyo and Professor Kunio Inoue of Tohoku University, will be stationed at the satellite and we will have researches jointly appointed from neutrino group.

One of the PI'S has already a grant with scientists at NAOJ to pursue the dark energy project. We also gather scientists from the world to conduct an analysis on the data from LHC. We have already a candidate for an associate professor.

Principal Investigators of the Institute collaborate with scientists from the following institutions:

1) IHES (Institut des Hautes Études Scientifiques) in France (for mathematics),
2) Yukawa Institute for Theoretical Physics, Kyoto University (for theoretical physics),
3) Department of Physics, Kyoto University (for neutrino physics),
4) High Energy Accelerator Research Organization (KEK) (for neutrino physics),
5) National Astronomical Observatory in Japan (NAOJ) (for dark energy survey and astronomy),
6) Department of Astrophysical Sciences, Princeton University in USA (for dark energy survey and astronomy)
7) Department of Physics, University of California, Berkeley in USA (for theoretical physics),
8) Research Center for Neutrino Science, Tohoku University.

(5) Research Environment

ⅰ) Provide an environment in which researchers can devote themselves exclusively to their research, by exempting them from other duties and providing them with adequate staff support to handle paperwork and other administrative functions.

The Director will secure the funds to hire administrative staff and research support staffs to assure that researchers of the Institute be exempt from paper works associated with conducing researchers. In addition, for PI's from University of Tokyo, the Office of the President will provide resources that enable PI's to substitute their teaching duties in their original departments.

ⅱ) Provide startup research funding as necessary to ensure that top-caliber researchers invited to the center do not upon arrival lose momentum in vigorously pursuing their work out of concern over the need to apply immediately for competitive grants.

Many of PI's of the Institute have already secured research fund by winning competitive grants. The Director will secure startup funds for young researchers and postdoctotal fellows hired by the Institute.

ⅲ) As a rule, fill postdoctoral positions through open international solicitations.

We will post all the job openings on major journals of the community such as Physics Today and will contact proactively via Emails leading scientists of the field, both in Japan and abroad, to solicit outstanding candidates.

ⅳ) Establish English as the primary language for work-related communication, and appoint administrative personnel who can facilitate the use of English in the work process.

In the fields of particle physics, mathematics and astronomy it has been the standard practice for researchers to speak English for work-related communication. We will assemble administrative staff members as well as research support members who are fluent in English with help from the Office of the President.

ⅴ) Adopt a rigorous system for evaluating research and a system of merit-based compensation. (For example, institute a merit-based annual salary system primarily for researchers from outside the host institution. As a basic rule, the salaries of researchers who were already employed at the host institution prior to the centers' establishment are

to be paid by the host institution.)

Salary of the center director will be negotiated through the office of the President. Annual salaries for PI's will be decided by the Director. Salaries of researchers other than PI's will be decided by the Director with consultation to Deputy Directors. Evaluation of researchers will be strictly merit-based and will include citation counts, invited talks at international conference, cross-disciplinary papers, salaries at competing institutions abroad, and leadership roles at the Institute.

vi) Provide equipment and facilities, including laboratory space, appropriate to a top world-level research center.

The University administration pledges to build a new building on Kashiwa campus for the Institute. The architecture will follow the style of Kavli Institute for Theoretical Physics at UC Santa Barbara and Center for Theoretical Physics at UC Berkeley with a large open area and amenities. It will provide an attractive and competitive environment for researchers from around the world.

We plan to have a state-of-art video conference system and internet-blackboards among Kashiwa, Hongo, Komaba, Kamioka and other collaborating institutions that stay on 24hours a day, 7days a week to make impromptu discussions possible.

vii) Hold international research conferences or symposiums regularly (at least once a year) to bring the world's leading researchers together at the center.

Annual international conference at the Institute as well as long-duration workshops à la Kavli Institute for Theoretical Physics and Aspen Center for Physics will be held. They will bring in visitors to further stimulate the intellectual activities and keep the Institute at the forefront of worldwide science.

viii) Other measures to ensure that top-caliber researchers from around the world can comfortably devote themselves to their research in a competitive international environment, if any.

The University is constructing Kashiwa International Lodge that will be a main residential facility for foreign researchers who have moved to the Institute and short-term visitors. Meanwhile, the University will help the foreign researchers to find housings. The Institute's foreign affairs office will fully conduct the business related to foreign researchers together with the Office of the President.

(6) Indicators for evaluating a center's global standing

) Criteria and methods to be used for evaluating the center's global standing in the subject field
ii) Results of current assessment made using said criteria and methods
ii) Goals to be achieved through the project (at time of interim and final evaluations)

1) We introduce quantitative and objective methods to evaluate the Institute's global standing. The number of refereed journal papers, the number of citations of the papers the Institute researchers published, and the number of presentations our researchers deliver in the major international conferences will be kept monitored and tracked. These "numbers" form a base of evaluation of the center 's global standing.

2) The number of visitors and the number of foreign visitors among them are another objective indicator to measure the activity and visibility of the Institute.

3) In order to evaluate how effective the Institute is to bring mathematicians and physicists together, we plan to monitor the number of publications co-authored by mathematicians and physicists. It will be a measure of the synergy between the two disciplines.

The proposed institute has already positioned itself as one of the most cited Institutions in Physics

)

research. This is because all the principal investigators we assembled are leading scientists in their own discipline and the number of citations of each investigator is outstanding.

Criteria 2 and 3 are, of course, yet to be applied.

The goal to meet the criteria 1) is clear. We will maintain the statue of the most cited Institution in Physics and Mathematics. We aim to be one of the most visible research organizations in Physics and Mathematics.

(7) Securing research funding

□) Past record

・ Indicate the total amount of research funding (e.g., competitive funding) secured by principal investigators who will join the center project. Itemize by fiscal year (FY2002-2006) taking into account the percentage of time each will devote to research activities at the center vis-à-vis the total time they spend conducting research activities ("Effort ②" in Appendix 2). For example, if this percentage is 70%, then 70% of his/her research funds can be counted in calculating the total amount of research funds.

FY2002: $9.7M, FY2003: $10.9M, FY2004: $9.5M, FY2005: $13.2M, FY2006: $13.6M
(in units of US dollars, Exchange Rate: JPY/USD=120)

Grand total of competitive funding awarded to PI's over past 5 years is $56.9M.

ii) Prospects after establishment of the center

・ Based on the past record, describe the concrete prospects for securing resources that match or exceed the project grant.
・ Calculate the total amount of research funding (e.g., competitive funding) based on the percentage of time the researchers devote to research activities at the center vis-à-vis the total time they spend conducting research activities ("Effort ②" in Appendix 2). Be sure the prospects are realistically based on the past record.

Principal Investigators of the Institute have already secured competitive funding that amounts to approximately $55M, the same level as that of the past five years. We are, therefore, confident to maintain the same funding profile well into the era of this new Institute.

Others

・ Describe activities and initiatives to be taken after project funding ends.

We intend to keep the Institute as the advanced institute of the University, a permanent entity that belongs to the University. We plan to work, with the Office of the President, to raise the fund.

・ Describe expected ripple effects (e.g., how the proposed research center project will have trailblazing components that can be referred to by other departments in the host institution and/or other research institutions when attempting to build their own top world-level research centers).

We are confident that our aggressive approach to assemble the world-leading scientists from other institutions from within Japan or from abroad and our ambitious organization will have significant impact to the University. Also the merit-based evaluation system we introduce would be so attractive to young researchers that it could become a model that other institutions would follow.

・ Describe other important measures to be taken in creating a world premier international research center, if any.

We will be proactive to raise funding for the Institute. In particular, we engage fundraising from the private sector both in Japan and abroad.

In order to promote competitive atmosphere among PI's and senior researchers, we plan to institute a named distinguished professorship. It will be awarded by the Institute Director to an Institute professor after rigorous evaluation of his/her performance at the Institute.

- If one or more of the projects applying for Global COE program have some connections with this research center project, list the project title(s) , outline(s), group leader(s) and the relationship(s) with this project.

Since the call for proposal of Global COE program for the disciplines related to the Institute, which are mathematics and physics, is scheduled for FY2008, there are no Global COE programs to list. Some of PI's, however, will definitely be involved in some of Global COE proposals that are under consideration. We as the Institute will seek close collaboration with such Global COE programs once they have been more developed and its relevance to the Institute has become more evident.