

News

IPMU Takes Part in 2010 Open House at UT Kashiwa Campus

An open house on the Kashiwa Campus of the University of Tokyo was held on October 29 and 30, 2010. It was the first occasion for IPMU to open its building to the public. Panels showing the IPMU research activities and a newly edited video to introduce IPMU were presented on the first floor. In the lecture hall, the Head of the IPMU's International Relations Section, Midori Ozawa, spoke about "Behind the Scenes of Hosting Foreign Researchers" on October 29. This was followed by a Japanese play – a parody of the Japanese folktale *Momotaro*, by nine IPMU's foreign researchers – which met with hearty laughter and applause from the audience. The next day, the IPMU Principal Investigator Ken'ichi Nomoto gave a lecture entitled "Evolution of the Universe Probed by Supernovae." Also, on the first day, a mascot character of Chiba prefecture, Chiba-kun, visited the IPMU (see a photo on page 3). A total of 630 people visited the IPMU during the two days.



A scene of Prof. Ken'ichi Nomoto's lecture.



Japanese play by IPMU's foreign researchers.

IPMU Jointly Hosted Program to Encourage Female Students to Study Science "Look into the Future!" at Kashiwa Campus

Since 2009, this program has been undertaken by S&T related graduate schools and institutions, including the IPMU at the University of Tokyo (see page 25 of the IPMU NEWS No. 7). This year, together with the Graduate School of Frontier Sciences and the Institute for Solid State Physics, the IPMU hosted "Look into the Future!" on October 30, during the 2010 Open House on the Kashiwa Campus. In the morning, around 60 female junior high school and high school students were divided into three groups, each visiting one of the three hosts. A group of around 20 students participated in a workshop at the IPMU "Let's Fathom the Enormity of the Universe!" organized by an IPMU postdoctoral fellow Masaomi Tanaka. They enjoyed the first experience in calculating the size of the Universe by themselves. In the afternoon, the three hosts jointly organized a panel discussion among female researchers as panelists. The participants also enjoyed conversations over tea during the break. This event was a good opportunity for the participants to get a sense of the appeal of research and of the life of a researcher.



IPMU Director Murayama Gave a Public Lecture in SpaceExpo "SORAHAKU 2010"

SpaceExpo "SORAHAKU 2010" was held from October 29–31, 2010, at the Science Museum located in Kitanomaru

Park, near the Imperial Palace in Tokyo, and IPMU Director Hitoshi Murayama gave a public lecture entitled "Will the Universe Ever End?" on October 31.

The aim of this event was to inspire the hopes, dreams, and curiosity of children for a new era of science and technology, by relating two different fields of study—Astronomy and Environmental Energy. A total of 31,627 people visited SORAHAKU 2010 over three days.

4th IPMU-ICRR Joint Public Lecture: "Travelling the Universe"

On October 14, 2010, the fourth IPMU-ICRR (Institute for Cosmic Ray Research) joint public lecture entitled "Travelling the Universe" was held at the Koshiba Hall on the Hongo Campus of the University of Tokyo, with an audience of about 130 people. IPMU Associate Professor Shinji Mukohyama gave a lecture entitled "The Universe beyond Four Dimensions," and ICRR Assistant Professor Hiroko Miyahara gave a lecture entitled "Climate of the Universe and Climate of the Earth." After the lectures, there was a long discussion session between the two lecturers and the audience in which many audience members ardently asked many questions, which the lecturers answered.



IPMU Participates in Science Agora 2010

Science Agora 2010 was held from November 11–21, 2010 at the Tokyo International Exchange

Center in Tokyo Academic Park in the Tokyo's waterfront region, Odaiba. It is an open "place of assembly," where science catalyzes interaction and stimulates discussion among participants with diverse backgrounds. In this event, the five WPI centers, including the IPMU, and Japan Society for Promotion of Science (JSPS) jointly organized a workshop entitled "Let's Think Together about Japan's Future Strategy," on November 20. Yuichi Takayanagi, Director of Tamarokuto Science Center, served as a facilitator, and four panelists well versed in the arenas of science in the world made presentations and discussion about what are needed now for the sake of Japan's future science and technology. Questions from the audience were taken into account in the discussion.

The SuMIRe Web Site Opened

The web site <http://sumire.ipmu.jp/> has been launched in order to publicize the purposes, outcomes, and the like of the "SuMIRe (Subaru Measurement of Images and Redshifts)" project. IPMU Director Hitoshi Murayama is the core researcher of this project—one of the 30 research projects selected by CSTP (Council for S&T Policy, Cabinet Office of Japanese Government) last year and supported by FIRST (Funding Program for World-Leading Innovative R&D on Science and Technology), see IPMU NEWS No. 10, page 20.

The 25th Nishinomiya-Yukawa Memorial Prize Awarded to Eiichiro Komatsu

Eiichiro Komatsu, Professor of Astronomy at the University of Texas at Austin and IPMU Joint Senior Scientist, was awarded the 25th Nishinomiya-Yukawa Memorial Prize for "Critical Tests of Theory of the Early

Universe Using the Cosmic Microwave Background Radiation." He contributed in constraining the cosmology parameters such as the age of the universe and dark energy, and thus the models of the early universe such as the inflation universe model using NASA's WMAP satellite. The award ceremony was held on November 4 at the Nishinomiya City Hall.

Tadashi Takayanagi Receives 2010 Yukawa-Kimura Prize

The Yukawa Memorial Foundation announced that this year's (4th) Toshiei Kimura Theoretical Physics Prize (Yukawa-Kimura Prize) has been awarded to IPMU Associate Professor Tadashi Takayanagi for his research on "Holography and Tachyon Condensation in Superstring Theory." His achievements in an exactly solvable matrix model for two-dimensional superstring, holographic calculations of entanglement entropy, and descriptions of tachyon condensations in superstring theory have been recognized by the award selection committee. The award ceremony will be held on January 19 at the Yukawa Institute for Theoretical Physics.

IPMU Senior Scientist Toshiyuki Kobayashi Awarded Inoue Science Prize

Toshiyuki Kobayashi, Professor at the Graduate School of Mathematical Sciences, the University of Tokyo, and IPMU Senior Scientist, won the 27th Inoue Science Prize for his contribution to the "analysis of infinite-dimensional symmetries." His outstanding achievements in the creation of a discontinuous group theory that goes beyond the framework of Riemann geometry, the invention of a fundamental theory of a discrete branching rule in the representation

theory in infinite dimensions, and the original contributions in anomalous unitary representation and non-commutative harmonic analysis, have been recognized as having significant impacts in many areas of mathematics and leading to the creation of new research areas. The award ceremony will be held on February 4, 2011.

Fuminobu Takahashi Receives 2011 PSJ Young Scientist Award

IPMU Assistant Professor Fuminobu Takahashi won the 5th Young Scientist Award of the Physical Society of Japan. He was selected as an award recipient in the division of cosmic-ray physics and astrophysics for his three articles, "Gravitino Overproduction in Inflaton Decay," "The Gravitino Overproduction Problem in the Inflationary Universe," and "Inflaton Decay in Supergravity." The award ceremony will be held on March 25, 2011 at the PSJ 2011 Annual Meeting.

An Article by Orland and Reffert Selected for the Highlights of 2009 and 2010 of *Classical and Quantum Gravity*

The Editorial Board of *Classical and Quantum Gravity (CQG)* selected the article "The renormalizability of Horava-Lifshitz-type gravities" by IPMU postdoctoral fellows Domenico Orlando and Susanne Reffert (<http://herald.iop.org/CQG/m176/jip/link/4076>) as one of the journal's Highlights of 2009 and 2010. *CQG* is an established journal for physicists, mathematicians, and cosmologists in the fields of gravitation and the theory of spacetime. The subject of their recognition is exactly what the IPMU emphasizes, namely, that a fusion of physics and mathematics is the key to solving the mysteries of the universe.

The President's Council of the University of Tokyo Visits IPMU

The President's Council of the University of Tokyo aims at receiving advice and support from world leaders in various fields to help increase the global prominence of The University of Tokyo. The Council members have diverse cultural and career backgrounds, representing 15 nationalities.

On November 19, 2010, President Hamada and nine members had a Council meeting on the Kashiwa campus, and after the meeting, members visited IPMU. They listened to Director Murayama's presentation about the outline of IPMU and had an informal discussion with IPMU researchers.



The IPMU Director's Book "What Is the Universe Made of?" Sells Well

A Japanese publishing company, Gentosha, Inc., published IPMU Director Murayama's book written for the layman, "What Is the Universe Made of?—Solving the Mystery of the Universe with Particle Physics." It is an introduction to particle cosmology, addressing such questions as "How did the universe begin?" "Why do we exist at all?" and "What is the fate of the universe?" from the viewpoint of particle physics. As of this writing, at the end of December 2010, more than 220,000 copies of the book have been sold. Director Murayama donates all the proceeds from the sales of this book to IPMU in support of its activities.

Santa Claus Family is Coming to Dongri from IPMU

Following last year's visit, IPMU Professor Mark Vagins visited Donguri Nursery School on the Kashiwa campus again this year. He was accompanied this year not only by his wife Michiyo, but also their 6-month-old son Isaac, all dressed up in a Christmas costume. They handed presents to the children and sang songs with them. The children were delighted at the magical moment with the Santa Claus family.



Focus Week on String Cosmology

A workshop entitled "Focus Week on String Cosmology" was held at IPMU from October 4–8, 2010. String cosmology is cosmology based on the superstring theory, a strong candidate as the ultimate theory. Various topics such as the beginning of the universe, the origin of cosmic inflation and observability in the cosmic microwave background were discussed.

Workshop: The Observational Pursuit of Dark Energy after Astro2010

The goal of this conference, held at Caltech from October 7–8, 2010, was to have a timely discussion on the optimum way forward in developing various dark energy probes in light of the recommendations of the US National Academy of Sciences Decadal Survey "Astro2010," the report of which was released on August 13, 2010. Discussions were made on current, imminent, and planned ground-

and space-based programs exploiting the various techniques to constrain dark energy, in a convivial atmosphere made possible in the Hameetman Auditorium of the recently-completed Cahill Center for Astronomy and Astrophysics at Caltech.

Workshop: The Evolution of Massive Galaxies and Their AGNs with the SDSS-III/BOSS Survey

The IPMU is a member institute of the SDSS-III/BOSS collaboration which is carrying out a massive spectroscopic survey of distant galaxies. This workshop, held at IPMU from October 25–28, 2010, brought together individuals from the BOSS community with a strong interest in studies of luminous galaxies and/or AGNs. There were fruitful discussions on topics ranging from the observational strategy and data analysis to scientific results based on the early data and future collaboration. Participants also enjoyed a Yakata-Bune (Japanese houseboat) cruise on the Tokyo Bay.

Mini Workshop on Neutrinos

Although neutrinos have been studied extensively in the past, the neutrino remains one of the least understood particles. In particular, it may be related to the origin of matter and physics beyond the standard model. The purpose of this meeting, held at the IPMU from November 8–11, 2010, was to review the current experimental and theoretical understandings of neutrinos and exchange ideas and opinions. Three theorists and five experimentalists were invited and active discussions were held on the recent hot topics in this field.

Workshop on Population III Gamma-Ray Burst

On November 15, 2010, ten astrophysicists gathered together at the IPMU to discuss prospects for detecting high-redshift gamma-ray bursts (GRBs). The farthest known GRB is located at $z=8.2$, when the universe was just 600 million years after the Big Bang. Planned satellites are expected to detect many such high- z GRBs. At the meeting, the spectral energy distribution from radio to X-ray bands was discussed.

Workshop: Supernova Explosions and Nucleosynthesis

The Origin of Matter and Evolution of the Galaxies (OMEG) Institute is a lecture series for nuclear astrophysics held by the Japan Forum of Nuclear Astrophysics. The 4th OMEG institute on "Supernova Explosions and Nucleosynthesis" was hosted by the IPMU on December 1, 2010. Two lectures were presented. Dr Christian D. Ott from Caltech gave a lecture on state-of-the-art computer simulations of supernova explosions, and Professor Friedrich-K. Thielemann provided a lecture on heavy elements nucleosynthesis beyond the iron-group.

Future Workshop: IPMU Workshop on Black Holes

The "IPMU Workshop on Black Holes" will be held at IPMU from February 21–25, 2011. Black holes are the hot topic in a broad range of research fields, from astronomical observations to theoretical calculations in string theory and loop quantum gravity. It is now timely to bring together people with very different backgrounds to encourage interdisciplinary discussions, looking for new ideas and collaborations, and the workshop will address this necessity.

IPMU Seminars

1. "Cosmological Aspects in Direct Gauge Mediation"
Speaker: Yutaka Ookouchi (IPMU)
Date: Sep 22, 2010
2. "A discrete approach to halo and galaxy clustering"
Speaker: Vincent Desjacques (ITP Zurich)
Date: Sep 24, 2010
3. "Quivers from Matrix Factorizations"
Speaker: David Morrison (UC Santa Barbara/IPMU)
Date: Sep 27, 2010
4. "Gauge theories and matrix models"
Speaker: Robbert Dijkgraaf (University of Amsterdam)
Date: Oct 01, 2010
5. "Lectures on the Bethe Ansatz: the physical system and the original Bethe solution for the XXX1/2 spin chain"
Speaker: Domenico Orlando (IPMU)
Date: Oct 01, 2010
6. "Dimer models and noncommutative crepant resolutions"
Speaker: Nathan Broomhead (Leibniz University)
Date: Oct 04, 2010
7. "Non-perturbative predictions of stochastic inflation and their dependence of initial conditions"
Speaker: Alexei A. Starobinsky (Landau Institute)
Date: Oct 07, 2010
8. "Lectures on the Bethe Ansatz: the Algebraic Bethe Ansatz for XXX1/2 spin chain"
Speaker: Domenico Orlando (IPMU)
Date: Oct 08, 2010
9. "Supergravity and string vacua in six dimensions"
Speaker: Washington Taylor (MIT)
Date: Oct 12, 2010
10. "General Gauge Mediation at the Tevatron and LHC"
Speaker: David Shih (IAS)
Date: Oct 13, 2010
11. "New Puzzles in Supermassive Black Hole Evolution"
Speaker: Charles Steinhardt (IPMU)
Date: Oct 14, 2010
12. "Quivers, Non-Commutative Geometry, and AdS/CFT"
Speaker: Richard Eager (UC Santa Barbara)
Date: Oct 14, 2010
13. "The magnetized universe via CMB"
Speaker: Yifung (Bess) Ng (Case Western Reserve University)
Date: Oct 14, 2010
14. "Gromov-Witten invariants and representations of infinite dimensional Lie algebras"
Speaker: Todor Milanov (IPMU)
Date: Oct 19, 2010
15. "The expanding Universe, PCA and supernova: an attempt to avoid dark energy parameterizations"
Speaker: Emille Ishida (IPMU)
Date: Oct 19, 2010
16. "The Magnetized Universe"
Speaker: Rafael da Silva de Souza (IPMU)
Date: Oct 21, 2010
17. "Nuclear Matrix Model"
Speaker: Koji Hashimoto (Riken)
Date: Oct 26, 2010
18. "Luminous Dark Matter"
Speaker: Brian Feldstein (IPMU)
Date: Oct 28, 2010
19. "Fefferman's program on conformal geometry and the Green functions of the conformal powers of the Laplacian"
Speaker: Raphael Ponge (The University of Tokyo)
Date: Oct 28, 2010
20. "Searching for binary supermassive black holes: from tens of kpc to sub-pc scales"

- Speaker: Yue Shen (CfA)
Date: Nov 01, 2010
21. "Inflation, reheating and flat direction preheating"
Speaker: Ahmet Emir Gumrukcuoglu (IPMU)
Date: Nov 04, 2010
 22. "Physical processes on stellar dynamics (relaxation, dynamical friction, phase-space consistency, etc)"
Speaker: Luca Ciotti (Bologna)
Date: Nov 04, 2010
 23. "Tidal fields, stellar escape from galaxies in clusters"
Speaker: Luca Ciotti (Bologna)
Date: Nov 05, 2010
 24. "Lectures on the Bethe Ansatz: the physical spectrum for the XXX1/2 spin chain"
Speaker: Domenico Orlando (IPMU)
Date: Nov 05, 2010
 25. "Hydrodynamics, Holographic Optics and Negative Refractive Index"
Speaker: Davide Forcella (ENS)
Date: Nov 09, 2010
 26. "Five Founding Questions of IPMU"
Speaker: Hitoshi Murayama (IPMU)
Date: Nov 11, 2010
 27. "Lectures on the Bethe Ansatz: the XXZ spin chain and the $SL(2|q)$ quantum symmetry"
Speaker: Domenico Orlando (IPMU)
Date: Nov 12, 2010
 28. "D-Brane Superpotentials: A Worldsheet Perspective"
Speaker: Marco Baumgartl (LMU, Munich)
Date: Nov 15, 2010
 29. "String-Loop Corrections to $c-a$ "
Speaker: Ruben Minasian (CEA/Saclay)
Date: Nov 16, 2010
 30. "Lefschetz trace formula and the l -adic cohomology of the Rapoport-Zink spaces"
Speaker: Yoichi Mieda (Kyushu

- University)
Date: Nov 16, 2010
31. "The theory of arithmetic D-modules and characteristic cycles"
Speaker: Tomoyuki Abe (The University of Tokyo)
Date: Nov 17, 2010
 32. "The galileon"
Speaker: Enrico Trincherini (SISSA, Trieste)
Date: Nov 18, 2010
 33. "Suoersymmetric T^3 Fibrations"
Speaker: David Morrison (UC Santa Barbara)
Date: Nov 18, 2010
 34. "Mirror Symmetry for Minuscule Varieties"
Speaker: Alexey Bondal (IPMU/Aberdeen)
Date: Nov 19, 2010
 35. "Lectures on the Bethe Ansatz: recent developments"
Speaker: Domenico Orlando (IPMU)
Date: Nov 19, 2010
 36. "Surface Operators and Wall Crossing"
Speaker: Sergei Gukov (Caltech)
Date: Nov 19, 2010
 37. "Local B-model and mixed Hodge structure"
Speaker: Yukiko Konishi (Kyoto University)
Date: Nov 22, 2010
 38. "Measurement of large scale fluctuation of CMB induced by large scale structure"
Speaker: Atsushi Nishizawa (IPMU)
Date: Nov 25, 2010
 39. "Dilogarithm identities in CFT and cluster algebras"
Speaker: Tomoki Nakanishi (Nagoya University)
Date: Nov 25, 2010
 40. "Calabi-Yau triangulated categories and Cluster tilting"
Speaker: Osamu Iyama (Nagoya University)

- Date: Nov 29, 2010
41. "Calabi-Yau triangulated categories and Cluster tilting"
Speaker: Osamu Iyama (Nagoya University)
Date: Nov 30, 2010
 42. "Gerbes and Topological Actions in Field Theory"
Speaker: Krzysztof Gawedzki (ENS-Lyon)
Date: Nov 30, 2010

IPMU Komaba Seminars

1. "Quasi-modular forms and Gromov-Witten theory of elliptic orbifold P^1 "
Speaker: Todor Milanov (IPMU)
Date: Oct 18, 2010
2. "Hamiltonian torus actions on orbifolds and orbifold-GKM theorem" (joint work with T. Holm)
Speaker: Tomoo Matsumura (Cornell University)
Date: Nov 26, 2010
3. "Borchers products in monstrous moonshine"
Speaker: Scott Carnahan (IPMU)
Date: Nov 29, 2010

Personnel Changes

Damien Easson, previously an IPMU postdoctoral fellow, has taken a position as an Assistant Professor at Arizona State University. He was at the IPMU from August 8, 2008 to December 15, 2010.

Also, Marcos Valdes, who was at the IPMU between November 13, 2008 and November 13, 2010, under the auspices of the JSPS's Postdoctoral Fellowship for Foreign Researchers, moved to the Scuola Normale Superiore di Pisa in Italy as a postdoctoral fellow.