

News

IPMU Celebrates First Anniversary

October 1, 2008, was the first anniversary for the IPMU. At a press conference held on October 2 to mark the occasion, Director Murayama noted that the institute is now “visible worldwide.” The institute has become a successful international research center with more than half of the staff scientists from abroad. A party was held on October 3 following a staff meeting and a PI (principal investigator) meeting.



Press conference



Birthday cake prepared by an IPMU volunteer

News from Kamioka Satellite

The IPMU Kamioka Satellite Office began operations on September 16, 2008 in Higashi-Mozumi, Kamioka, Hida City in Gifu Prefecture, about ten minutes drive from the Super-Kamiokande and KamLAND. Currently, the satellite office is within the Kamioka Observatory Office of the Institute for Cosmic Ray Research.

A new IPMU satellite building is under construction and expected to be completed by the end of this fiscal year.

Shigeki Sugimoto Co-winner of 2008 Yukawa-Kimura Prize

On October 7, 2008, the Yukawa Foundation announced that this year's (2nd) Toshiei Kimura Theoretical Physics Prize (Yukawa-Kimura Prize) has been awarded to Shigeki Sugimoto of IPMU and Tadakatsu Sakai of Ibaraki University for their contributions to the development of a holographic dual of QCD based on gauge/string-gravity correspondence. This is an achievement to describe strong interactions among hadrons (such as protons, neutrons, and mesons) using superstring theory. Their pioneering work has attracted significant attention and their two papers have garnered nearly five-hundred citations. The award ceremony will take place on January 23, 2009.

The Yukawa-Kimura Prize is given to those who make a significant contribution in fundamental theoretical research in the areas of gravity/space-time theory, field theory, and related areas. Winners of the prize are expected to continue to take leading roles in these areas.

Ken'ichi Nomoto and International Colleagues Resolve Supernova Puzzle Using Subaru Telescope

Prof. Ken'ichi Nomoto (IPMU principal investigator) and international colleagues have confirmed that the supernova observed by Danish astronomer Tycho Brahe in 1572 was a standard type Ia supernova. Their findings are based on a spectroscopic analysis of visible-light echoes from the Tycho supernova remnant and were published in the December 4, 2008, issue of Nature.

Type Ia supernovae are an important tool in observational cosmology. Studies of them revealed the existence of dark energy. They are also a dominant source of the heavy elements around us. “Echo” light may allow the mechanism of type Ia supernova to be studied in three dimensions.

Second Meeting of the External Advisory Committee

The second meeting of the IPMU External Advisory Committee was held on November 18, 2008. The six participants (including those attending via video conferencing) offered useful advice regarding future activities for IPMU.



External Advisory Committee

Public Lecture by Director Hitoshi Murayama on “The Mystery of the Missing Antimatter”

A two-day open house was held October 24-25, 2008, at the Kashiwa Campus of the University of Tokyo.

On October 25, IPMU Director Hitoshi Murayama gave a public lecture at the Media Hall in the University's Kashiwa Library. The lecture, entitled "The Mystery of the Missing Antimatter," covered the Kobayashi-Masukawa theory that had won the 2008 Nobel Prize in Physics as well as other topical subjects. The lecture was very well received by the audience of two hundred and eighty people.



Director Murayama's lecture at Media Hall was well attended.

Director Murayama later gave a lecture on the same subject at Miraikan (National Museum of Emerging Science and Innovation) during "Science Agora 2008," which was held November 22-24, 2008 in Odaiba, Tokyo. The lecture was jointly organized by the IPMU and the Study Group for Communications in Science and Technology, which is a network of people in charge of communications at various research centers and universities. The Study Group promotes the development of expertise by encouraging members to share problems and information with others outside their affiliations.

After the lecture, Director Murayama and two others from different institutions exchanged opinions. Through his participation in this event, Director Murayama showed his strong support for scientific communication.

Conference Report

Workshop: Exceptional Collections and Degenerations of Varieties

This workshop was held September 1-5, 2008, in the IPMU seminar room.

Focus Week: Quantum Black Holes

Held September 12-16, 2008, in the Media Hall at the University of Tokyo's Kashiwa Library, this event was organized to foster further progress in understanding quantum black holes and developing a new language - new mathematics - to describe quantum gravity. Seventy people, many from abroad, attended the 5-day event.



Discussing quantum black holes

Focus Week: Micro-Local Analysis on Symplectic Manifolds

This workshop was held September 16-18, 2008, in the IPMU seminar room.

Focus Week: Messengers of Supernova Explosions

Held November 17-21, 2008, in the Conference Room at the Kashiwa Library, this event allowed supernova researchers to summarize and discuss their various areas of current research. Further details are reported on page 13.

Future Conferences

Workshop: Supersymmetry in Complex Geometry

This six-day workshop will be

held January 4-9, 2009. Physicists have used supersymmetry to invent many new kinds of generalized Kähler structures, which are useful in the study of complex geometry. The workshop will provide mathematicians and physicists working in supersymmetry and generalized complex geometry the opportunity to discuss their progress and perspectives.

Focus Week: Determining the Masses and Spins of New Particles Found at the LHC

This 5-day event will be held March 16-20, 2009. If new particles are found at the LHC, the main challenge will be to correctly determine their masses and interactions amid a huge background as well as huge production and decay processes. The aim of this focus week will be to review and compare the many methods that have been proposed in recent years for determining the mass and spin of a new particle and to explore the physics that may emerge from these analyses.

Seminars

The IPMU hosts regular seminars every Wednesday at 3:30. Speakers from around the world are invited. Information is posted on the IPMU website at <http://ipmu.jp/seminars>.

One purpose for these regular seminars is to encourage researchers from different fields to understand a variety of specialties.

Separate seminars are also held for each research field. At present, seminars for particle physics and astrophysics are held every Thursday at 1:30 p.m. Seminars for mathematics and mathematical physics are held every Thursday at 3:30 p.m. All seminars are in English. Mathematics

seminars are also held at Komaba Campus. (See IPMU Komaba Seminars)

IPMU Seminars

1. "The FZZ-Duality Conjecture—A Proof"
Speaker: Yasuaki Hikida (KEK)
Date: September 3, 2008
2. "Abundance of Thermal Relics in Non-standard Cosmological Scenarios"
Speaker: Mitsuru Kakizaki (Bonn University)
Date: September 9, 2008
3. "Black Hole Entropy in String Theory—A Window into the quantum Structure of Spacetime"
Speaker: Atish Dabholkar (University Paris 6)
Date: September 10, 2008
4. "Testing origin of neutrino mass at the LHC"
Speaker: Kai Wang (IPMU)
Date: September 10, 2008
5. "Topological Interactions at the LHC and Generalized Landau-Yang Theorem"
Speaker: Jing Shu (IPMU)
Date: September 17, 2008
6. "What we know and may ever know about inflation"
Speaker: Brian Powell (IPMU)
Date: September 18, 2008
7. "Holographic non-local operators"
Speaker: Shuji Matsuura (University of Tokyo / Perimeter institute)
Date: September 18, 2008
8. "A Holographic Dual of Bjorken Flow"
Speaker: Shin Nakamura (Center for Quantum Spacetime (CQEST), Sogang University)
Date: September 19, 2008
9. "Effects of particle production during inflation"
Speaker: Antonio Enea Romano (YITP)
Date: September 22, 2008
10. "The Phenomenology of Gravity"
Speaker: Simon Dedeo (Chicago)
Date: September 24, 2008
11. "The View from UChicago"
Speaker: Simon Dedeo (Chicago)
Date: September 25, 2008
12. "A possible observational signature of the weight of vacuum energy"
Speaker: Cosimo Bambi (IPMU)
Date: October 1, 2008
13. "SO and USp Kähler and HyperKähler Quotients and Lumps"
Speaker: Sven Bjarke Gudnason (University of Pisa)
Date: October 2, 2008
14. "CP Violation for the Heaven and the Earth"
Speaker: George Hou (National Taiwan University)
Date: October 2, 2008
15. "Combining Lensing, X-ray, and galaxy dynamic Measurements in Clusters"
Speaker: Doron Lemze (Tel Aviv)
Date: October 7, 2008
16. "Formation of dust in primordial supernovae and its survival within the supernova remnants"
Speaker: Takaya Nozawa (IPMU)
Date: October 8, 2008
17. "Results on the proton structure from HERA"
Speaker: Shima Shimizu (ZEUS)
Date: October 9, 2008
18. "Testing LCDM with Subaru Observations of Cluster Mass Profiles"
Speaker: Tom Broadhurst (Tel Aviv/Visitor)
Date: October 10, 2008
19. "Conformal field theory and vertex operator algebras"
Speaker: Akihiro Tsuchiya (IPMU)
Date: October 14, 2008
20. "Matching QCD radiation in gluino and squark production at the LHC"
Speaker: Johan Alwall (SLAC)
Date: October 14, 2008
21. "Wall Crossing"
Speaker: Maxim Kontsevich (IHES)
Date: October 14, 2008
22. "Jet angular correlation in vector-boson fusion processes at hadron colliders"
Speaker: Kaoru Hagiwara (KEK)
Date: October 16, 2008
23. "Quantum Crystals and Topological Strings"
Speaker: Domenico Orland (IPMU)
Date: October 16, 2008
24. "From the whistle of a kettle to the asymmetric explosion of supernovae"
Speaker: Thierry Foglizzo (Service d'Astrophysique & Waseda)
Date: October 22, 2008
25. "A new dimension for the AdS/CFT correspondence"
Speaker: David Berenstein (University of California, Santa Barbara)
Date: October 22, 2008
26. "Echoes of supersymmetry from the early universe: bayrons, dark matter, and gravitational waves"
Speaker: Alex Kusenko (UCLA)
Date: October 23, 2008
27. "Poisson groups and differential Galois theory of Schroedinger equation on the circle"
Speaker: Michael Semenov-Tian-Shansk (University of Bourgogne)
Date: October 27, 2008
28. "Dunkl operators and quadratic algebras"
Speaker: Anatoli Kirillov (University of Bourgogne)
Date: October 27, 2008
29. "Properties of Bayrons in Holographic QCD"
Speaker: Shigeki Sugimoto (IPMU)

- Date: October 29, 2008
30. "The Fermi Gamma-ray Space Telescope"
Speaker: Hiromitsu Takahashi (GLAST)
Date: October 30, 2008
31. "Conjectures on motives: case of simple threefolds"
Speaker: Sergey Gorchinskiy (Steklov Mathematical Institute)
Date: November 5, 2008
32. "Predictions from the Multiverse"
Speaker: Lawrence Hall (UC Berkeley)
Date: November 5, 2008
33. "Identifying Weakly Interacting Massive Particles from Direct Dark Matter Detection Data"
Speaker: Chun-Lin Shan (Seoul National University)
Date: November 6, 2008
34. "Cosmological unification of string theories"
Speaker: Simeon Hellerman (IPMU)
Date: November 6, 2008
35. "What can you do with Cosmic Microwave Background as a Backlight?"
Speaker: Shirley Ho (Princeton)
Date: November 10, 2008
36. "Modified gravity as an alternative to dark energy"
Speaker: Kazuya Koyama (Portsmouth)
Date: November 17, 2008
37. "The Dark Energy Puzzle"
Speaker: Pisin Chen (National Taiwan University & Stanford)
Date: November 19, 2008
38. "Hierarchy Problems in String Theory: An Overview of the LARGE Volume Scenario"
Speaker: Joe Conlon (Oxford)
Date: November 20, 2008
39. "Quantum groups at roots of unity and invariants of links"
Speaker: Nicolai Reshetikhin (UC Berkeley & Amsterdam)

- Date: November 20, 2008
40. "Toward a Proof of Montonen-Olive Duality via Multiple M2-branes"
Speaker: Seiji Terashima (YITP)
Date: November 27, 2008
41. "Groups of intermediate rank"
Speaker: Mikaël Pichot (IPMU)
Date: November 28, 2008

IPMU Komaba Seminars

The IPMU Komaba seminars bring together researchers from the IPMU and the University Tokyo's Graduate School of Mathematical Sciences to exchange ideas. The seminars are held about twice a month at the Komaba campus.

1. "A pair of non-birational but derived equivalent Calabi-Yau manifolds from non-Abelian gauge theories"
Speaker: Kentaro Hori (IPMU)
Date: December 1, 2008

In this seminar, Kentaro Hori presented his recent work. Following the seminar, many of the mathematicians and physicists engaged in stimulating discussions.



Promotions

Yukinobu Toda, previously an IPMU assistant professor, was promoted to IPMU associate professor. Satoshi Kondo, previously an IPMU postdoctoral fellow, was promoted to IPMU assistant professor. The two new appointees provided the

following statements regarding their research plans.

Yukinobu Toda

My research area is algebraic geometry, specifically the derived categories of coherent sheaves on algebraic varieties. Recently, I introduced counting invariants of objects in the derived category (generalized Donaldson-Thomas invariants) and am now studying their wall-crossing phenomena as well as how they relate to Gopakumar-Vafa invariants via wall-crossing formula.



Satoshi Kondo

The computation of higher algebraic K-theory of varieties in number theory interests me. Recently, I used motivic homotopy theory for the computation. I plan to perform an explicit computation of other cohomology theories of varieties that appear in both number theory and physics.



Personnel Changes

Sugumi Kanno, previously an IPMU postdoctoral fellow, has taken a position as a postdoctoral fellow at Durham University in England. She was at the IPMU between April 1 and September 30, 2008.

Yuuji Sano, previously an IPMU postdoctoral fellow, has taken a position as an assistant professor in Kyushu University's Global COE Program (Education and Research Hub for Mathematics for Industry). He was at the IPMU between February 1 and October 31, 2008.