

Yukinobu TODA Wins the 2014 MSJ Spring Prize

Kavli IPMU

Associate Professor Yukinobu Toda has won the 2014 MSJ (The Mathematical Society of Japan) Spring Prize for his outstanding contributions to the study of derived categories of algebraic varieties. The MSJ Spring Prize was established in 1988 as the successor of the Iyanaga Prize which had been established in 1973. It is awarded to its members under the age of 40 to recognize outstanding mathematical achievement. The awards ceremony was held on March 16, 2014 at the MSJ Spring Meeting 2014 at Gakushuin University.



Yukinobu Toda

J-PARC Neutrino Beam Group Awarded the 2013 Suwa Prize

The J-PARC Neutrino Beam Group (Professor Takashi Kobayashi of KEK as a representative) has been awarded the 2013 Suwa Prize by the FAS (Foundation for High Energy Accelerator Science) for their contribution to the discovery of electron neutrino appearance in



Mark Hartz

the T2K Experiment by creating and operating the highest intensity neutrino beam facility. Kavli IPMU Assistant Professor Mark Hartz is among the prize winners. The Suwa Prize was established by the FAS and is given to researchers, engineers, and research groups recognizing exceptional performance, such as long-term contributions, for the development of high-energy accelerators and their application in science. The awards ceremony was held on February 17, 2014 at Arcadia Ichigaya in Tokyo.

Lisa Randall Gave a Public Lecture "Knocking on Heaven's Door"

On January 25, 2014, Kavli IPMU hosted a public lecture, "Knocking on Heaven's Door," delivered by a theoretical physicist Lisa Randall, Professor at Harvard University, at the Koshiba Hall on the University of Tokyo's Hongo campus. She talked about the experiments at the CERN's Large Hadron Collider (LHC) and the Higgs boson discovery in these experiments, from the viewpoint of a theoretical physicist. She also discussed from the vast Universe to its building blocks, the elementary particles, and their relations taking note of their very different scales. Professor Randall's talk was interpreted by Kavli IPMU Director Hitoshi Murayama in Japanese at short intervals with explication. This style of lecture was well received by the audience as easy to understand. As Professor Randall is popular for her books for general audiences, which are translated into Japanese, the venue was near capacity and there were a number of people who listened to the lecture while taking notes.

You can also find an interview with

Professor Randall on pages 12-16 in this issue of the *Kavli IPMU News*, by Kavli IPMU Associate Professor Shinji Mukohyama.



After the lecture, Professor Randall is answering questions. The person on the right is Kavli IPMU Director Murayama.

WPI Institutes Jointly Participated in AAAS 2014 in Chicago

The 2014 AAAS (American Association for the Advancement of Science) Annual Meeting was held for five days, February 13 – 17, 2014, at Hyatt Regency Chicago as a main venue with a theme of "Meeting Global Challenges: Discovery and Innovation." The 9 WPI institutes jointly participated following the AAAS 2013 in Boston and AAAS 2012 in Vancouver (in 2012 and 2013, 6 WPI institutes participated).

The AAAS Annual Meeting has been held since 1848 when the AAAS, a nonprofit professional society dedicated to the advancement of scientific and technological excellence across all disciplines, and to the public's understanding of science and technology, was founded. The AAAS is also known as the publisher of the famous science journal, *Science*. The AAAS Annual Meeting is a widely recognized global science gathering, bringing thousands of scientists, engineers, policymakers, educators, science journalists, and general public together to discuss the most recent developments in science and technology in a variety of programs.

The 9 WPI institutes jointly hosted the WPI booth for three days, February 14-16, as part of the Japan pavilion organized by the Japan Science and Technology Agency (JST), and held a one-hour workshop entitled “Build a Career in Japan!” jointly with RIKEN. In this workshop, a MEXT officer Hideki Iwabuchi (Director, WPI/Office for the Promotion of Basic Research, Basic Research Promotion Division, Research Promotion Bureau) introduced the WPI program, and Petros Sofroni, Director of the International Institute for Carbon-Neutral Energy Research (I²CNER) explained advanced and global research activities at the WPI institutes.



WPI booth at the Japan Pavilion.

Murayama Project “SuMIRe” Participated in FIRST EXPO 2014

On February 28 and March 1, 2014, FIRST EXPO 2014 was held at Bellesalle Shinjuku Grand in Tokyo to present the outcomes of the FIRST (Funding Program for World-Leading Innovative R&D on Science and Technology) to the general public at the end of the last year of the program. Led by the Council for Science and Technology Policy (CSTP) in the Cabinet Office, Government of Japan, the FIRST program was inaugurated in FY2009 to advance world-leading research that will strengthen Japan’s international competitiveness while contributing to society and public welfare through the application of its results. The

CSTP selected the top 30 researchers with highest potential from various fields. The total budget for the FIRST Program was ¥100 billion over a period of five years. Kavli IPMU Director Hitoshi Murayama’s SuMIRe (Subaru Measurement of Images and Redshifts) project is one of the 30 selected projects. It aims at revealing the nature of Dark Matter and Dark Energy and uncovering the Origin and Future of the Universe through the most advanced astronomical observations with ultra-wide field of view imaging as well as spectroscopy using the Subaru Telescope.

At FIRST EXPO 2014, the outline and the results of the selected 30 projects were presented by researchers of the respective projects. There were also exhibition booths and many other events. From the SuMIRe project, a full-scale replica of an aspherical lens used for Hyper Suprime-Cam (HSC), an ultra-wide field digital camera, was displayed. The SuMIRe project has been involved with production of the HSC’s aspherical lenses. Mounted on the Subaru Telescope, HSC has been made available for observations this year. In addition, Kavli IPMU Professor Masahiro Takada, who is one of the core members of the project, talked on the present status and the expected outcomes of the SuMIRe project on February 28.



Professor Takada, giving a lecture.

A Program to Encourage Female Students to Study Science “Come Over to Learn the Universe!”

On March 15, 2014, a Program to Encourage Female Students to Study Science, “Come Over to Learn the Universe!” was held at Kavli IPMU, jointly hosted by Kavli IPMU and the Institute for Cosmic Ray Research (ICRR), the University of Tokyo, and 35 high school and junior high school female students participated. This is part of an attempt which the University of Tokyo has planned, supported by the Japan Science and Technology Agency (JST), to encourage female students in studying science as their future path by inspiring their interests in the fields of science. The students listened to lectures given by two female researchers, Miho Ishigaki (JSPS postdoctoral fellow at Kavli IPMU) and Rieko Momose (project researcher at ICRR), about their respective researches, and practiced, under the guidance of graduate-student teaching assistants, laser interferometry which is applied to a gravitational wave telescope. Then, the students had friendly talks with postdocs and graduate students at the Kavli IPMU’s Interaction Area. The participating students expressed their impressions such as, “It was nice to hear the life of university students,” and, “I got interested in the Universe much more than before.”



Friendly conversations at the Kavli IPMU’s Interaction Area.

Kavli IPMU Seminars

1. "Naturalness, Conformal Symmetry and Duality"
Speaker: Yoshiharu Kawamura (Shinshu U)
Date: Nov 06, 2013
2. "Triple Intersection Formulas for Isotropic Grassmannians"
Speaker: Vijay Ravikumar (TIFR)
Date: Nov 06, 2013
3. "Linear canonical relations and their quantization"
Speaker: Alan Weinstein (UC Berkeley)
Date: Nov 06, 2013
4. "Minicourse on the Madsen-Weiss Theorem [Part 3]"
Speaker: Charles Siegel (Kavli IPMU)
Date: Nov 07, 2013
5. "Some foundations of extended quantization"
Speaker: James Michael Wallbridge (Kavli IPMU)
Date: Nov 07, 2013
6. "Minicourse on the Madsen-Weiss Theorem [Part 4]"
Speaker: Charles Siegel (Kavli IPMU)
Date: Nov 08, 2013
7. "The Moduli and Gravitino (non)-Problems in Models with Strongly Stabilized Moduli"
Speaker: Jason Evans (U Minnesota)
Date: Nov 08, 2013
8. "Higher derived categories of relative exact categories and non-connective K-theory"
Speaker: Satoshi Mochizuki (Chuo U)
Date: Nov 12, 2013
9. "Entanglement Renormalization and Black Holes in AdS/CFT"
Speaker: Tadashi Takayanagi (YITP)
Date: Nov 12, 2013
10. "Conformal Blocks and the Ising Model"
Speaker: Simon Wood (Kavli IPMU)
Date: Nov 12, 2013
11. "The Search for sub-GeV Dark Matter"
Speaker: Rouven Essig (Stony Brook U)
Date: Nov 15, 2013
12. "Spherical DG-functors"
Speaker: Timothy Logvinenko (Cardiff U)
Date: Nov 18, 2013
13. "DW theory using cohomology with coefficients in Picard groupoids"
Speaker: Alexander Voronov (U Minnesota)
Date: Nov 19, 2013
14. "Exact results for boundaries and domain walls in 2d supersymmetric theories"
Speaker: Takuya Okuda (U Tokyo)
Date: Nov 19, 2013
15. "Loop Groups and Conformal Blocks"
Speaker: Jesse Wolfson (Northwestern U)
Date: Nov 19, 2013
16. "Challenges and accomplishments of the ATLAS experiment at the Large Hadron Collider"
Speaker: Fabiola Gianotti (CERN)
Date: Nov 20, 2013
17. "The bounded denominator conjecture for vector-valued modular forms"
Speaker: Christopher Marks (U. Alberta)
Date: Nov 21, 2013
18. "WISH: Wide-field Imaging Surveyor for High-redshift"
Speaker: Toru Yamada (Tohoku U)
Date: Nov 21, 2013
19. "The chemical abundance patterns of the most metal-poor stars"
Speaker: Norbert Christlieb (Heidelberg U)
Date: Nov 22, 2013
20. "Finding the most metal-poor stars with SkyMapper and first results, including a $[Fe/H] < -7$ star"
Speaker: Anna Frebel (MIT)
Date: Nov 22, 2013
21. "Non-existence of semi-orthogonal decompositions and sections of the canonical bundle"
Speaker: Shinnosuke Okawa (Osaka U)
Date: Nov 25, 2013
22. "Deformed supersymmetric gauge theories from string- and M-theory (Part I): Introduction to the fluxtrap background"
Speaker: Susanne Reffert (CERN)
Date: Nov 26, 2013
23. "Deformed supersymmetric gauge theories from string- and M-theory (Part II): Applications"
Speaker: Domenico Orlando (École Normale Supérieure)
Date: Nov 26, 2013
24. "Future high-energy gamma-ray observatory: Cherenkov Telescope Array (CTA)"
Speaker: Masaaki Hayashida (ICRR)
Date: Nov 27, 2013
25. "New Insights into the Formation and Evolution of the Most Massive Galaxies"
Speaker: Danilo Marchesini (Tufts U)
Date: Nov 27, 2013
26. "Primitive forms via polyvector fields"
Speaker: Changzheng Li (Kavli IPMU)
Date: Nov 28, 2013
27. "Re-interpreting kinematic variables in the LHC searches"
Speaker: Myeonghun Park (Kavli IPMU)
Date: Nov 29, 2013
28. "Exact Partition Functions on RP2 and Orientifolds"
Speaker: Heeyeon Kim (KIAS)
Date: Dec 03, 2013
29. "Asymptotic safety of the

- Standard Model and the Higgs boson mass”
Speaker: Mikhail Shaposhnikov (EPFL)
Date: Dec 04, 2013
30. “Reflection relations and fermionic basis”
Speaker: Fedor Smirnov (LPTHE)
Date: Dec 05, 2013
31. “The Dark Past and Bright Future of Radio Detection of UHECRs”
Speaker: Konstantin Belov (UCLA)
Date: Dec 05, 2013
32. “Etale cohomology, l-adic sheaves and Deligne-Lusztig theory”
Speaker: Tanmay Deshpande (Kavli IPMU)
Date: Dec 05, 2013
33. “An Algorithmic Approach to Heterotic String Phenomenology”
Speaker: Seung-Joo Lee (KIAS)
Date: Dec 06, 2013
34. “Equilibrating the Quark-Gluon Plasma: Flow, Fluctuations and Thermalization”
Speaker: Berndt Mueller (Duke U)
Date: Dec 09, 2013
35. “Phase transitions in high density Yang-Mills matter”
Speaker: Giorgio Torrieri (Columbia U)
Date: Dec 09, 2013
36. “Cosmology with the South Pole Telescope”
Speaker: Nils Halverson (U Colorado)
Date: Dec 11, 2013
37. “Searching for Dark Matter through Radio Observations: Present and Future”
Speaker: Aravind Natarajan (U of Pittsburgh)
Date: Dec 12, 2013
38. “Some uses of entropy in birational geometry”
Speaker: Ilya Karzhemanov (Kavli IPMU)
Date: Dec 12, 2013
39. “Holographic topological insulators and superconductors”
Speaker: Moshe Rozali (U. British Columbia)
Date: Dec 12, 2013
40. “The Little Bang Standard Model”
Speaker: Ulrich Heinz (Ohio State U)
Date: Dec 13, 2013
41. “Testing Strong Gravity with X-Ray Spectroscopy of AGN”
Speaker: Sachiko Tsuruta (Montana State U)
Date: Dec 13, 2013
42. “Why is the generalized second law true?”
Speaker: Aron Wall (UCSB)
Date: Dec 17, 2013
43. “Representations on the cohomology of hypersurfaces and mirror symmetry”
Speaker: Alan Stapledon (U of Sydney)
Date: Dec 18, 2013
44. “WH expansion applied for the Non-linear Dark Matter Power Spectrum and its Applications”
Speaker: Toshifumi Futamase (Tohoku U)
Date: Dec 19, 2013
45. “Scale Invariant Extension of the Standard Model with QCD-like hidden sector and composite Dark Matter”
Speaker: Jisuke Kubo (Kanazawa U)
Date: Dec 20, 2013
46. “Classification of 6D SCFTs”
Speaker: David Morrison (UCSB)
Date: Jan 14, 2014
47. “Modular family of 3D higher-spin theory”
Speaker: Wei Li (AEI)
Date: Jan 14, 2014
48. “Quantum Liouville’s Theory and Modular Double of $U_q(\mathfrak{sl}(2, \mathbb{R}))$ ”
Speaker: Ivan Ip (Kavli IPMU)
Date: Jan 14, 2014
49. “Formation of First Stars”
Speaker: Takashi Hosokawa (U Tokyo)
Date: Jan 15, 2014
50. “The weak lensing and clustering of SDSS III galaxies: from astrophysics to cosmology”
Speaker: Surhud More (Kavli IPMU)
Date: Jan 16, 2014
51. “Crystalline companion of l-adic sheaves”
Speaker: Tomoyuki Abe (Kavli IPMU)
Date: Jan 16, 2014
52. “Stabilization of Linear Higher Derivative Gravity with Constraints”
Speaker: Tai-jun Chen (Cambridge)
Date: Jan 17, 2014
53. “Dirac graphs”
Speaker: Corneliu Sochichiu (GIST)
Date: Jan 21, 2014
54. “Recurrence (and resummation) of conformal blocks”
Speaker: Cornelius Schmidt (Kavli IPMU)
Date: Jan 21, 2014
55. “Double Disk Dark Matter”
Speaker: Lisa Randall (Harvard U)
Date: Jan 24, 2014
56. “Local quantum cohomology and mixed Frobenius Structure”
Speaker: Yukiko Konishi (Kyoto U)
Date: Jan 27, 2014
57. “Mirror symmetry for minuscule Schubert complete intersections”
Speaker: Makoto Miura (U Tokyo)
Date: Jan 28, 2014
58. “Observations of Star Forming Galaxies in the Heart of the Reionization Era”
Speaker: Richard Ellis (Caltech)
Date: Jan 28, 2014
59. “CohFT and conformal blocks, or, how I learned to stop worrying and compute all the Chern classes”
Speaker: Charles Siegel (Kavli IPMU)
Date: Jan 28, 2014
60. “SUSY, Seesaw, CMB”
Speaker: Shinsuke Kawai (Sungkyunkwan U)

- Date: Jan 29, 2014
61. "Non-Hydrogen Supernovae within Extended Envelopes: Light Curve Modeling and Parameter Dependences"
Speaker: Elena Sorokina (Lomonosov Moscow State U)
Date: Jan 30, 2014
62. "Flops and S-duality conjecture"
Speaker: Yukinobu Toda (Kavli IPMU)
Date: Jan 30, 2014
63. "Stringy Differential Geometry and N=2 D=10 Supersymmetric Double Field Theory"
Speaker: Jeong-Hyuck Park (Sogang U)
Date: Feb 04, 2014
64. "Naturally inflating on steep potentials through electromagnetic dissipation"
Speaker: Lorenzo Sorbo (U Massachusetts, Amherst)
Date: Feb 05, 2014
65. "How many is different? Answer from the ideal Bose gas"
Speaker: Jeong-Hyuck Park (Sogang U)
Date: Feb 06, 2014
66. "Subaru Telescope Adaptive Optics Observations of the SDSS Gravitationally Lensed Quasars"
Speaker: Rusu Cristian Eduard (U Tokyo / NAOJ)
Date: Feb 06, 2014
67. "Review of Dark Matter Search with Liquid Xe Detector and Recent Results from XMASS"
Speaker: Hiroyuki Sekiya (ICRR)
Date: Feb 07, 2014
68. "Stueckelberg Portal into Dark Sectors"
Speaker: Gary Shiu (UW Madison/ HKUST)
Date: Feb 12, 2014
69. "Nonlinear velocity statistics and redshift-space distortions in peculiar velocity surveys"
Speaker: Teppei Okumura (Kavli IPMU)
Date: Feb 13, 2014
70. "Interplay between Randers metrics and the causal geometry of stationary spacetimes. Almost isometries."
Speaker: Miguel Angel Javaloyes (U Murcia, Spain)
Date: Feb 14, 2014
71. "New physics searches with boosted tops"
Speaker: Takeuchi Michihisa (King's College London)
Date: Feb 19, 2014
72. "Supernova SN 2012dn: A spectroscopic clone to SN 2006gz"
Speaker: Devendra Sahu (Indian Institute of Astrophysics, Bangalore)
Date: Feb 19, 2014
73. "High-Energy Neutrinos as New Cosmic Messengers"
Speaker: Kohta Murase (IAS)
Date: Feb 21, 2014
74. "How Large is a Neutron Star?"
Speaker: Jim Lattimer (Stony Brook U)
Date: Feb 24, 2014
75. "Higgs branch localization of 3d N=2 theories"
Speaker: Masazumi Honda (Harish-Chandra Research Institute)
Date: Feb 25, 2014
76. "Planck cosmology, Galaxy Clusters, and Neutrino Masses: the View from the Optical"
Speaker: Eduardo Rozo (SLAC)
Date: Feb 25, 2014
77. "Justice for supersymmetric hybrid inflation"
Speaker: Valerie Domcke (SISSA)
Date: Feb 26, 2014
78. "Young diagrams and intersection numbers for toric manifolds associated with Weyl chambers"
Speaker: Hiraku Abe (Waseda U)
Date: Feb 27, 2014
79. "Evolution of the star formation and gas content in galaxies through cosmic time"
Speaker: Emanuele Daddi (CEA-Saclay)
Date: Feb 27, 2014
80. "The Gauged Linear Sigma Model and GIT"
Speaker: Richard Driessnack Eager (Kavli IPMU)
Date: Feb 27, 2014
81. "Hypercharged dark matter and a new approach to halo-independent direct detection analysis"
Speaker: Brian Feldstein (Oxford)
Date: Feb 28, 2014
82. "Lagrangian embedding of cubic 4-folds containing a plane"
Speaker: Genki Oouchi (Kavli IPMU)
Date: Mar 03, 2014
83. "A Landscape in Boundary String Field Theory"
Speaker: Koji Hashimoto (Osaka U / Riken)
Date: Mar 04, 2014
84. "Cosmology with new gravitational degrees of freedom"
Speaker: Baojiu Li (Durham U)
Date: Mar 05, 2014
85. "Derived categories, noncommutative motives and commutative theorems"
Speaker: Marcello Bernardara (Institut de Mathématiques de Toulouse)
Date: Mar 10, 2014
86. "The Fluid Gravity Correspondence"
Speaker: Shiraz Minwalla (Tata Institute)
Date: Mar 10, 2014
87. "Scattering in Large N Matter Chern Simons theories"
Speaker: Shiraz Minwalla (Tata Institute)
Date: Mar 11, 2014
88. "The latest results from the T2K experiment"

- Speaker: Yoshinari Hayato (ICRR)
Date: Mar 11, 2014
89. "Predictions for the Dirac CP Violation in the Lepton Sector"
Speaker: Serguey Petcov (SISSA/INFN, Kavli IPMU)
Date: Mar 12, 2014
90. "A large number of fast cosmological simulations for the revised WiggleZ BAO measurement"
Speaker: Jun Koda (Swinburne U of Technology)
Date: Mar 14, 2014
91. "A Holographic Model of the Kondo Effect"
Speaker: Jackson Wu (NCTS Hsinchu, Taiwan)
Date: Mar 18, 2014
92. "Implications of 98 GeV and 125 GeV Higgs scenario in non-decoupling SUSY"
Speaker: Dilip Kumar Ghosh (Indian Association for the Cultivation of Science)
Date: Mar 19, 2014
93. "Inflation driven by the SM Higgs field after BICEP result"
Speaker: Kohei Kamada (EPFL)
Date: Mar 24, 2014
94. "Pfaffian sum formula for the symplectic Grassmannians"
Speaker: Takeshi Ikeda (Okayama U of Science)
Date: Mar 24, 2014
95. "The Leptonic CP Phase from T2(H)K and oscillations from μ^+ Decay at Rest"
Speaker: Jarah Evslin (IHEP/Beijing, IMP/Lanzhou)
Date: Mar 25, 2014
96. "FQH/CFT and q-CFT"
Speaker: Taro Kimura (CEA Saclay/RIKEN)
Date: Mar 25, 2014
97. "Supersymmetric Renyi Entropy"
Speaker: Tatsuma Nishioka (IAS Princeton)

- Date: Mar 26, 2014
98. "The Type Ia supernovae rate with Subaru/XMM-Newton Deep Survey"
Speaker: Jun Okumura (Kyoto U)
Date: Mar 27, 2014
99. "Q&A Session with Professor Peter Goddard"
Speaker: Peter Goddard (IAS, Princeton)
Date: Mar 27, 2014

Kavli IPMU Komaba Seminars

1. "Exact Results In Two-Dimensional (2,2) Supersymmetric Gauge Theories with Boundary"
Speaker: Mauricio Romo (Kavli IPMU)
Date: Nov 18, 2013
2. "Characteristic classes from 2d renormalized sigma-models"
Speaker: Hans Jockers (U Bonn)
Date: Jan 30, 2014

Personnel Changes

Promotion

Surhud More, previously Kavli IPMU postdoctoral fellow, was appointed as a Kavli IPMU Assistant Professor on March 1, 2014.



Moving Out

The following people left the Kavli IPMU to work at other institutes. Their time at the Kavli IPMU is shown in square brackets.

Kavli IPMU Professor Shigeki Sugimoto [April 1, 2008 – March 31, 2014] moved to the Yukawa Institute for Theoretical Physics, Kyoto University as a Professor.

Kavli IPMU Professor Hiroshi Karoji

[April 1, 2010 – May 31, 2010 as a Project Researcher, and June 1, 2014 - March 31, 2014 as a Project Professor] moved to the National Institutes of Natural Sciences (NINS) as a specially appointed Professor.

Kavli IPMU postdoctoral fellow Katsuyuki Naoi [April 1, 2012 – February 28, 2014] moved to Division of Mathematical Science, the Graduate School of Engineering, Tokyo University of Agriculture and Technology as a Lecturer.

Kavli IPMU postdoctoral fellow Takaya Nozawa [September 1, 2008 – March 31, 2014] moved to the National Astronomical Observatory of Japan (NAOJ) as a specially appointed Assistant Professor.

Kavli IPMU postdoctoral fellow Tomoki Saito [May 1, 2010 – March 31, 2014] moved to the Institute for Cosmic Ray Research, the University of Tokyo as a postdoctoral researcher.

JSPS postdoctoral fellow Mitsutoshi Fujita [April 1, 2013 – March 31, 2014] moved to the Yukawa Institute for Theoretical Physics, Kyoto University as a JSPS postdoctoral fellow, accompanying his host researcher, Professor Shigeki Sugimoto.

JSPS postdoctoral fellow Kunio Kaneta [April 1, 2013 – March 31, 2014] moved to the Institute for Cosmic Ray Research, the University of Tokyo as a project researcher.

JSPS postdoctoral fellow Shunsuke Tsuchioka [April 1, 2011 – March 31, 2014] moved to the "Leading Graduate Course for Frontiers of Mathematical Sciences and Physics" (FMSP), the Graduate School of Mathematical Sciences, the University of Tokyo as a Project Assistant Professor.