

Minister of State Yosuke Tsuruho Visits Kavli IPMU

On November 11, Minister of State for Science and Technology Policy Yosuke Tsuruho visited the Kavli IPMU, accompanied by Yoshio Yamawaki (Director General for Science, Technology and Innovation of Cabinet Office), Yasuyoshi Kakita (Director, Promotion Policy Division, Research Promotion Bureau of Ministry of Education, Culture, Sports, Science and Technology), and other government officers.

Director Hitoshi Murayama began by presenting an overview of the Kavli IPMU and its research activities. He also explained the World Premier International Research Center Initiative (WPI) as well as the present status of the SuMIRe project conducted under the Cabinet Office's Funding Program for World-Leading Innovative R&D on Science and Technology (FIRST) and the applications and technologies derived from basic research. Then, after having looked over the Kavli IPMU building, the guests joined researchers and talked with them at tea time. (See a picture on page 3.)

Toshiyuki Kobayashi Selected as a Fellow of the American Mathematical Society

On November 1, 2016, the

American Mathematical Society (AMS) announced the list of the 2017 Class of Fellows; University



Toshiyuki Kobayashi

of Tokyo Graduate School of Mathematical Sciences Professor and Kavli IPMU Principal Investigator Toshiyuki Kobayashi was among those selected. The AMS has recognized his contributions to the structure and representation theory of reductive Lie groups. Professor Kobayashi has paved the way for a new mathematics via his research on the theory of discontinuous groups, branching laws of infinite-dimensional representations, and global analysis of minimal representations, and pioneered revolutionary breakthroughs in mathematics.

The Fellows of the American Mathematical Society program was inaugurated in 2012. It recognizes members who have made outstanding contributions to the creation, exposition, advancement, communication, and utilization of mathematics. *The responsibilities of Fellows are to take part in the election of new Fellows, to present a "public face" of excellence in mathematics, and to advise the President and/or the Council on public matters when requested.**

Tadashi Takayanagi Awarded the 2016 Nishina Memorial Prize

On November 10, 2016, the Nishina Memorial Foundation announced that the 2016 Nishina Memorial Prize was to be given to Kyoto University Yukawa Institute for Theoretical Physics Professor and Kavli IPMU



Tadashi Takayanagi

Visiting Senior Scientist Tadashi Takayanagi for the discovery and development of the holographic entanglement entropy formula.

The holographic entanglement entropy formula, which Tadashi Takayanagi and his colleague Ryu Shinsei published in 2006, is now widely known as the Ryu-Takayanagi formula and regarded as an important formula in theoretical physics. Professor Takayanagi's leading contributions to the development of the Ryu-Takayanagi formula over the past 10 years and to elucidation and application of the mechanism of the holographic principle have been recognized.

Kyoji Saito Awarded the 2016 Kiyoshi Oka Prize

On December 3, 2016, Kavli IPMU Principal Investigator Kyoji Saito was awarded the inaugural



Kyoji Saito

Kiyoshi Oka Prize. The award ceremony was held at the beginning of the 15th Oka Symposium at Nara Women's University in Nara City.

The award bears the name of world-renowned mathematician Kiyoshi Oka, who was a professor emeritus at Nara Women's University. Established in 2016, the prize is given to *mathematicians who have found interesting problems and solutions, have broken new ground in mathematics, and have made promising discovery and innovation for future mathematics.***

Professor Saito is a world-class mathematician in the field of complex geometry. He has been working

* Cited from the AMS Fellows Program Document.

** Cited from http://www.nara-wu.ac.jp/omi/oka_prize_en.html

on various subjects in complex geometry and representation theory. In particular, his theory of primitive forms and their period maps, and theory of elliptic Lie algebras and their representation theory have had a wide influence not only in mathematics but also in physics, including superstring theory and topological field theory. These achievements, which have led to new developments, as well as his longtime contributions to the mathematics community, have been recognized.

Kavli IPMU Staff Received the University of Tokyo's Special Award for Operational Improvement in 2016

The Kavli IPMU Administrative Division team, represented by Rieko Tamura of the International Relations and Researchers Support Section, received the University of Tokyo's 2016 Special Award for Operational Improvement. The team consists of 20 members that took part in the "Win-Win Project towards University Globalization." The Awards for Operational Improvement is divided into three ranks: the President's Award, the Executive Vice President's Award, and the Special Award given by the University's Division for Operational Improvements. Every year, teams of university staff members are invited to implement ideas for operational improvement, and the awards are given to teams that have shown excellent achievements.

The Kavli IPMU team planned and implemented two programs: "Lunchtime English Training" and "Language Exchange with IPMU Researchers." These programs raised the English proficiency of administrative staff, and reduced inefficiencies around English

language-related tasks. In addition, "Language Exchange with IPMU Researchers" is a program carried out between Kavli IPMU staff and researchers from abroad. It is a win-win program as recognized by the award: the exchange is an opportunity for the researchers to improve their knowledge of Japanese language and culture.

Open Campus Kashiwa 2016

On October 21 and 22, 2016, the University of Tokyo's Kashiwa Campus held an open campus under the banner "Kashiwa Knowledge: Discover and Experience."

At the Kavli IPMU lecture hall, two public lectures were given. On the first day, Kavli IPMU Associate Professor Naoyuki Tamura spoke about "A Survey of the Universe with the PFS (Prime Focus Spectrograph), A New Spectrometer for the Subaru Telescope, Will Observe an Unprecedented Number of Galaxies and Stars at the Same Time." The next day, Kavli IPMU Director Hotoshi Murayama spoke about "Ripples in Spacetime—Gravitational Waves Open Up a New Way to Probe the Universe —." (See pictures on page 3.) In addition, Kavli IPMU Professor Naoki Yoshida and Kavli IPMU Artist-in-Residence Norimichi Hirakawa, a media artist who stayed at the Kavli IPMU twice in July and September 2016, had a conversation about "Common Features between Science and Art."



Naoyuki Tamura, giving a lecture.

The Kavli IPMU also presented a two-day program including an exhibition of artist Hirakawa's new media art pieces inspired by his residence at the Kavli IPMU, "Research at Kavli IPMU" poster presentations, mathematical puzzles, guided tours of the Kavli IPMU building, a display of books written or recommended by IPMU researchers, and a screening of Particle Fever. This is a documentary film that follows the lives of six researchers as they search for answers about how our universe was made, and witnesses moments of scientific breakthrough at the Large Hadron Collider. It has Japanese subtitles, in cooperation with UC Berkeley Professor and Kavli IPMU Visiting Senior Scientist Yasunori Nomura, and by Kavli IPMU staff.

In two days, a total of 9,600 people visited the campus. The Kavli IPMU attracted more than 2,900 people

Note: Readers who are interested in Mr. Hirakawa's Artist-in-Residence story at the Kavli IPMU can find his report as well as an Artist Interview in this issue of the *Kavli IPMU News* (pp. 20–23).

Event: "Actually I Really Love Physics! —Career Paths of Female Physics Graduates"

On November 19, 2016, the University of Tokyo's Kavli IPMU, Institute for Solid State Physics, and Institute for Cosmic Ray Research jointly hosted an event called "Actually I Really Love Physics! — Career Paths of Female Physics Graduates" at the Kavli IPMU, and there were 33 participants. This event was held to support female students in physics to plan their careers. For that purpose, various speakers of physics graduates talked their career paths and the attractiveness of the

field of physics. It was also aimed to create a network of participants on this occasion.

In the morning, four speakers talked about topics including their career paths and research for 10 to 20 minutes each.

In the afternoon, there were two thirty-minute lectures. Kavli IPMU Director Hitoshi Murayama spoke on the topic “What I started to see as I majored in physics—the forefront of astrophysics research and achievements of female researchers.” The University of Electro-Communications Associate Professor Haruka Tanji then gave a lecture entitled “What I saw when I broke out of my shell—Study at a graduate school in the U.S. and afterwards.” In her lecture, she also spoke about reconciling research with raising a child.

After the lectures, the participants toured the three host institutes. The final program of the event was a meeting of the lecturers and participants. A friendly atmosphere, with tea and cookies being served, produced active interactions among the participants, and the event ended successfully. (See a picture on page 3.)

15th Kavli IPMU/ICRR Joint Public Lecture. “The Observable Universe and Beyond”

On November 27, 2016, the Kavli IPMU and the Institute for Cosmic Ray Research (ICRR) held the 15th joint public lecture at the Ito Hall of the University of Tokyo’s Hongo campus. “Observable Universe and Beyond” was the main topic and it attracted an audience of about 300 people including junior high school and high school students.

The first lecture entitled “Observing Formation and Evolution of Galaxies

with Large Telescopes” was given by ICRR Assistant Professor Yoshiaki Ono. He talked about studies of the evolution of the neutrality of the universe, which elucidate the reionization epoch when cosmological structure formation started. In particular, he focused on surveys of distant galaxies that are important in understanding the number density of galaxies in the early universe.

Then Kavli IPMU Associate Professor Taizan Watari spoke on “Beyond Our Universe, Far to Observe, People Say, Different Worlds Exist.” Having started with quoting Karl Busse’s poem *Über den Bergen*,*** he developed the topic by comparing “happiness imagined to dwell over the mountains” to the laws of physics in the worlds which we cannot yet observe. He said, “While our laws of physics seem to hold within the universe we can observe, it is possible that the laws of physics and constants beyond the observable universe are different from ours.” He then explained a possible world resulting from slight changes in physics laws and constants.

After the lectures, Professor Ono and Professor Watari answered questions from each other and the audience. There was then a further opportunity of communication between the lecturers and the attendees in the foyer of Ito Hall, and many of them eagerly asked questions at that time.



Taizan Watari (left) and Yoshiaki Ono (right).

*** English translation (copyrighted):
The LiederNet Archive: http://www.lieder.net/lieder/get_text.html?TextId=3453.

Director Murayama Talked at the WPI 10th Anniversary Symposium

On December 17, 2016, the WPI 10th Anniversary Symposium “Towards the Future of Science in Japan” was held at Assembly Hall, East Annex, Ministry of Education, Culture, Sports, Science and Technology (MEXT), under the sponsorship of MEXT and the Japan Society for the Promotion of Science (JSPS) and with the cooperation of all the nine WPI centers. In this symposium, Kavli IPMU Director Hitoshi Murayama spoke on “The Beginning and the End of the Universe.” His lecture and other lectures (all in Japanese) can be seen at https://www.jsp.go.jp/j-toplevel/13_lecture.html. Also, see a picture on page 3.

Kavli IPMU Seminars

1. “State-sum constructions of spin-TFTs and fermionic SPT phases”
Speaker: Lakshya Bhardwaj (Perimeter Inst for Theoretical Physics)
Date: Aug 23, 2016
2. “QCD jet substructure and its simulation”
Speaker: Yasuhito Sakaki (Kavli IPMU)
Date: Aug 24, 2016
3. “Quantum Nature of D-branes”
Speaker: Yoshifumi Hyakutake (Ibaraki U)
Date: Aug 25, 2016
4. “Spaces with holonomy G₂ and their use in M-theory”
Speaker: David Morrison (UC Santa Barbara)
Date: Aug 25, 2016
5. “Rise of the Proto-Galaxy System in the Universe”
Speaker: Jason Xavier Prochaska (UC Santa Cruz)
Date: Aug 31, 2016
6. “Natural Low-Scale Inflation and the Relaxion”

- Speaker: Jason Evans (KIAS)
Date: Sep 07, 2016
7. "Conformal bootstrap in Mellin space"
Speaker: Kallol Sen (Kavli IPMU)
Date: Sep 21, 2016
 8. "Z and Lepton-Flavor Violation"
Speaker: Po-Yen Tseng (Kavli IPMU)
Date: Sep 21, 2016
 9. "The result of the MEG experiment with the full dataset"
Speaker: Daisuke Kaneko (Kavli IPMU)
Date: Oct 05, 2016
 10. "Generalized Monstrous Moonshine"
Speaker: Scott Carnahan (Tsukuba U)
Date: Oct 11, 2016
 11. "Multidimensional Simulations of Magnetar Powered Supernovae"
Speaker: Ke-Jung Chen (NAOJ)
Date: Oct 13, 2016
 12. "Gauge Theory and Calibrated Geometry for Calabi-Yau 4-folds"
Speaker: Yalong Cao (Kavli IPMU)
Date: Oct 13, 2016
 13. "Exact results in N=2 gauge theories"
Speaker: Francisco Morales (INFN Sezione di Roma)
Date: Oct 18, 2016
 14. "B-Physics Puzzles and Lepton Flavor Violation"
Speaker: Olcyr Sumensari (LPT Orsay)
Date: Oct 19, 2016
 15. "The other 95%: Insights from Strong Gravitational Lensing"
Speaker: Tommaso Treu (UCLA)
Date: Oct 19, 2016
 16. "Cosmology beyond the B-mode spectrum from BICEP2/Keck Array"
Speaker: Toshiya Namikawa (Stanford U)
Date: Oct 20, 2016
 17. "The Coherent Satake Category and Line Operators in N=2 Gauge Theory"
Speaker: Harold Williams (UT Austin)
Date: Oct 20, 2016
 18. "Radiation-hydrodynamic modeling of supernova shock breakout in multi-dimension"
Speaker: Akihiro Suzuki (Kyoto U)
Date: Oct 20, 2016
 19. "Hints for New Physics from a Rare Decay of Beryllium-8?"
Speaker: Tim Tait (UCI)
Date: Oct 21, 2016
 20. "D-instantons and indefinite theta series"
Speaker: Boris Pioline (CERN)
Date: Oct 21, 2016
 21. "Lecture 1: Dark matter halos"
Speaker: Houjun Mo (U Massachusetts)
Date: Oct 25, 2016
 22. "Lecture 2: Gas processes and galaxy formation"
Speaker: Houjun Mo (U Massachusetts)
Date: Oct 25, 2016
 23. "Introduction to topological field theories"
Speaker: Takuo Matsuoka
Date: Oct 26, 2016
 24. "Reconstructing the initial conditions to simulate the formation of the local universe"
Speaker: Houjun Mo (U Massachusetts)
Date: Oct 26, 2016
 25. "A Massive Progenitor of Strongly Lensed Supernova Refsdal"
Speaker: Petr Baklanov (ITEP Moscow)
Date: Oct 27, 2016
 26. "Introduction to topological field theories"
Speaker: Takuo Matsuoka
Date: Oct 27, 2016
 27. "Gravitational-wave memory observables and charges of the extended BMS algebra"
Speaker: David A. Nichols (Radboud U Nijmegen)
Date: Oct 28, 2016
 28. "Gauge Theory and Calibrated Geometry for Calabi-Yau 4-folds: Part II"
Speaker: Yalong Cao (Kavli IPMU)
Date: Oct 28, 2016
 29. "Searching for Dark Matter with Gamma Rays"
Speaker: Simona Murgia (UCI)
Date: Oct 31, 2016
 30. "A 1d Theory for Higgs Branch Operators"
Speaker: Ran Yacoby (Princeton U)
Date: Nov 01, 2016
 31. "Double ramification hierarchies"
Speaker: Paolo Rossi (Inst Mathematics at Burgundy)
Date: Nov 01, 2016
 32. "Dark matter self-interactions - from observations to particle physics"
Speaker: Felix Kahlhoefer (DESY)
Date: Nov 02, 2016
 33. "Carbon-Enhanced Metal-Poor Stars and Asymptotic Giant Branch Nucleosynthesis"
Speaker: Richard Stancliffe (Argelander-Institut fur Astronomie, Bonn)
Date: Nov 08, 2016
 34. "Self-Dual Yang-Mills Theory and Twistors"
Speaker: Alexei Rosly (ITEP)
Date: Nov 08, 2016

Personnel Changes

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 postdoctoral fellow Teppei Okumura [January 1, 2014 – December 31, 2016] moved to ASIAA in Taiwan as an Associate Research Fellow.

JSPS Postdoctoral Fellow Richard Calland [November 2, 2014 – November 1, 2016] moved to Preferred Networks Inc. as a Researcher.