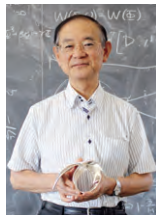


PI Ken'ichi Nomoto Received the Marcel Grossmann Award

Kavli IPMU Principal Investigator Ken'ichi Nomoto's work "for heralding the role of binary systems in the evolution of massive stars" has earned him a Marcel Grossmann Award. The Awards were established in

1985 to honor the contribution mathematician Grossmann made to Einstein's construction of general relativity. Grossman had helped Einstein overcome mathematical difficulties in Riemannian geometry. The two had been classmates at the ETH Zurich and had continued their friendship. The Grossmann Awards are presented at the Marcel Grossmann Meeting on Recent Developments in Theoretical and Experimental General Relativity, Gravitation, and Relativistic Field Theory, held every three years, to recipients who are recognized for their outstanding achievements in the fields covered in this Meeting. This year's Meeting was held at University of Rome "La Sapienza" in Rome. The award ceremony was held on July 13.



Ken'ichi Nomoto holding a silver casting of sculpture "Traction of Events in Space-Time," presented to each recipient.

Nobel Laureate Gerard 't Hooft Visited Kavli IPMU

Utrecht University Distinguished University Professor Gerard 't Hooft visited the Kavli IPMU, and gave a colloquium talk entitled "The Large Hadron Collider and New Avenues in Elementary Particle Physics" on April 16. 't Hooft was awarded the 1999 Nobel Prize in Physics for elucidating the quantum structure of electroweak interactions. In his talk, he reviewed milestones in the development of the Standard Model of elementary particles in reference to the discovery of the Higgs boson at CERN's Large Hadron Collider (LHC), and then explained what we could expect in the future with the LHC, which has restarted experiments using higher energy and luminosity, for elucidating remaining mysteries in particle physics. For example, discoveries of new particles would lead to new physics.

In this issue of the Kavli IPMU News, Shigeki Sugimoto, Professor at the Yukawa Institute for Theoretical Physics, Kyoto University, interviews Professor Gerard 't Hooft, see pp. 14 - 21.



Gerard 't Hooft giving a talk.

Screening of a Documentary Film *Particle Fever*

A hundred people crowded into the Kavli IPMU's hall to watch a special screening of *Particle Fever* on April 5. This documentary film, distributed by ro*co films international, follows the

lives of six physicists over the course of five years as they search for the Higgs particle at CERN. Interwoven with this story, the film illuminates how science and art are similar. It does this by emphasizing how they motivate us by driving curiosity, and they make us strive for what we don't have yet. In short, they make us human.

Kavli IPMU Professor and University of California Berkeley Professor Yasunori Nomura helped produce the Japanese subtitles for this special Kavli IPMU version, with permission from the movie company.

After the screening, participants were able to meet and hear behind the scenes stories from Johns Hopkins University Professor David Kaplan, who starred in and produced the film. While Professor Nomura served as interpreter, he kept the audience engaged with his wit and very liberal interpretations added with his own opinion.



Yasunori Nomura (left) and David Kaplan (right).



After screening, participants surround Yasunori Nomura and David Kaplan.

Deciphering the Universe: Joint Public Event with ICRR

On April 18, 400 people squeezed into a hall at the Amuser Kashiwa,

near the JR Kashiwa station, to take part in the 12th joint public lecture event by two University of Tokyo institutes, the Kavli IPMU and the Institute for Cosmic Ray Research (ICRR).

ICRR Associate Professor Shinji Miyoki gave the first talk on “The Last Homework from Einstein—Catch Gravitational Waves!” He explained the importance of the gravitational wave research and introduced the audience to experiments designed to find their direct evidence. Then, Kavli IPMU Professor and University of California Berkeley Professor Yasunori Nomura talked on “The Multiverse Cosmology—The Origin, Fate, and Outside of the Universe Predicted by the Latest Physics Theory.” He enthusiastically explained what the multiverse theory is about, a theory that postulates the existence of many universes, and touched on its philosophical aspect. He also touched on the possibility of universes under different laws of physics.



Yasunori Nomura giving a talk.

Kavli IPMU Hosts Interaction Collaboration Meeting at Kamioka

On April 20–21, seventeen press officers from CERN, Fermilab, and eight other world-renowned particle physics research institutes traveled to the Kavli IPMU’s Kamioka Branch Office for the Interaction Collaboration Meeting. Joined by four guest press officers from three institutes including RIKEN and the ICRR, participants shared their recent

experiences, and there were updates on each institute’s activities. Kavli IPMU Director Hitoshi Murayama gave a talk about research at the Kavli IPMU, and a Kavli IPMU press officer gave an update on the institute’s outreach activities. The meeting ended with a tour of the Super-Kamiokande, EGADS, XMASS, KamLAND, and KAGRA guided by Kavli IPMU and ICRR researchers.



Meeting at the Kavli IPMU’s Kamioka Branch Office.



Participants visiting EGADS during the guided tour.

Kavli IPMU Social Group Art Project Takes Over Piazza Fujiwara

From May 12 to June 9, the Kavli IPMU Arts Society hosted the 5th *Science and Everyday Life* project in the Piazza Fujiwara. In this project, all Kavli IPMU researchers and staff are invited to contribute pictures corresponding to a given theme. This time, 27 pieces were put on display corresponding to the theme “order,” including travel photos, photos of geodesic models, original composition of images, diagrams excerpted from published papers, formulae, and texts.

During the free drink (contributed by Director Murayama and Administrative Director Haruyama) get together on May 29, people enjoyed a night chatting and looking

at displayed pieces.



Kavli IPMU researchers and staff chatting in the Piazza Fujiwara.



Enjoying displayed pieces.

Journalist in Residence in Mathematics Program at the Kavli IPMU

On May 14–16, the Kavli IPMU welcomed Sankei Shimbun reporter Takeshi Maeda as part of a Journalist in Residence (JIR) program coordinated by Professor Koji Fujiwara at the Department of Mathematics, Kyoto University, with the cooperation of the Mathematical Society of Japan.

The program has been running since 2010, and is designed to give journalists the opportunity to experience a mathematics department or institute, and interview working mathematicians. To date, more than 30 people, mainly journalists, but also including TV directors, artists, and a lawyer, have taken part in the program.

For Maeda, it was an eye-opening opportunity to get to know the mathematics community through hearings, teatime, and seminars. “Being here was like riding a

rollercoaster. I hope to use the things I've learned and spread the word to a wider audience," he said.

On June 29, US freelance journalist George Musser visited the institute on the same program. While he could only stay a day, the people here had a profound impact on him. "Talking to Kavli IPMU researchers was amazing, really mind-blowing," he said.

The Kavli IPMU hopes to continue to welcome these journalists into our institute.

Science Café Universe 2015 Begins

On June 21, the Kavli IPMU teamed up with the Tamarokuto Science Center in Nishitokyo City to host the first of a three-part Science Café Universe 2015 running from June to July. Altogether, three researchers from different fields talk their stories about using physics and mathematics to solve the mysteries of the universe. The Science Café Universe series has been held every year since 2009, making this the seventh in its series.

On this day, more than 40 participants, mostly junior high and high school students, listened to Kavli IPMU Professor Yoichiro Suzuki, who talked in detail about what dark matter is, and how he and his colleague are trying to uncover its identity. The participants enjoyed his talk in a relaxed atmosphere with tea and cookies.



Yoichiro Suzuki giving a talk.

Kavli IPMU Seminars

1. "Exploring the Higgs sector of Georgi-Machacek model at colliders"
Speaker: Cheng-wei Chiang (NCU)
Date: Apr 01, 2015
2. "The Multiverse—Emerging New View of Fundamental Physics"
Speaker: Yasunori Nomura (UC Berkeley / Kavli IPMU)
Date: Apr 01, 2015
3. "Oceans Of Data And Rosetta Stones: Understanding How The First Galaxies Formed"
Speaker: Peter Capak (Caltech)
Date: Apr 02, 2015
4. "Next obstacles in precision neutrino oscillations: neutrino-nucleus cross-sections"
Speaker: Federico Sanchez (IFAE Barcelona)
Date: Apr 03, 2015
5. "Lense-Thirring precession in strong gravitational fields"
Speaker: Chandrachur Chakraborty (Saha Inst. of Nucl. Phys.)
Date: Apr 03, 2015
6. "The Dark Energy Spectroscopic Instrument (DESI) Survey"
Speaker: Stephen Bailey (LBNL)
Date: Apr 07, 2015
7. "Modelling and reconstruction of the cosmological large-scale structure from galaxy redshift surveys"
Speaker: Francisco-Shu Kitaura (AIP)
Date: Apr 07, 2015
8. "Detecting Ultra-light Dark Matter with Precision Metrology"
Speaker: Surjeet Rajendran (UC Berkeley)
Date: Apr 08, 2015
9. "Lessons for Gravity from Entanglement"
Speaker: Arpan Bhattacharya (IIS, Bangalore)
Date: Apr 09, 2015
10. "A Higgs or the Higgs? A Detailed look at the Anomalous Higgs Couplings"
Speaker: Banerjee Shankha (Harish-Chandra Research Inst)
Date: Apr 15, 2015
11. "Gravitational Lensing with KiDS"
Speaker: Konrad Kuijken (Leiden U)
Date: Apr 16, 2015
12. "The Large Hadron Collider and New Avenues in Elementary Particle Physics"
Speaker: Gerard 't Hooft (U Utrecht)
Date: Apr 16, 2015
13. "Probing Physics behind Neutrino Masses"
Speaker: Kaladi Babu (Oklahoma State U)
Date: Apr 17, 2015
14. "Painleve equations and weight system"
Speaker: Hayato Chiba (Kyushu U)
Date: Apr 20, 2015
15. "Local Lyman alpha emitters: last results from the LARS project"
Speaker: Daniel Kunth (IAP)
Date: Apr 20, 2015
16. "Probing the relationship between Galaxies and Dark Matter with Lensing and Clustering in CFHTLenS/VIPERS"
Speaker: Jean Coupon
Date: Apr 21, 2015
17. "Analytic Bootstrap: Universality at large spin and large twist"
Speaker: Kallol Sen (IIS Bangalore)
Date: Apr 21, 2015
18. "The progenitors and environments of hydrogen-poor core-collapse supernovae"
Speaker: Hanindyo Kuncarayakti (U Chile)
Date: Apr 22, 2015
19. "Measuring Cosmic Shear with the Dark Energy Survey"
Speaker: Matthew Becker (Stanford/KIPAC)

- Date: Apr 23, 2015
20. "Flat structure on isomonodormic deformations"
Speaker: Tomoyuki Mano (Ryuukyuu U)
Date: Apr 24, 2015
21. "The credibility of SUSY phenomenology: some silver linings"
Speaker: Biswarup Mukhopadhyaya (Harish-Chandra Research Inst)
Date: Apr 24, 2015
22. "The NeverEnding story of Cosmic Microwave Background and Large Scale Structure correlations"
Speaker: Alessandro Manzotti (U Chicago)
Date: Apr 24, 2015
23. "Torsion in the codimension-two Chow group of some toric varieties"
Speaker: Wanshun Wong (U Ottawa)
Date: Apr 28, 2015
24. "Latest results from the Planck satellite and implications for star formation properties"
Speaker: Daisy Mak (KICC)
Date: Apr 30, 2015
25. "The new results from Alpha Magnetic Spectrometer (AMS)"
Speaker: Sadakazu Haino (Academia Sinica)
Date: May 07, 2015
26. "Surprises in gauge theories: temperature-reflection symmetry, hidden"
Speaker: David McGady (Kavli IPMU)
Date: May 12, 2015
27. "Beyond Thermodynamics: the Physics of Matter, Life, and Intelligence"
Speaker: Piet Hut (IAS/ELSI)
Date: May 12, 2015
28. "2HDM scalar potential and the role of symmetries"
Speaker: Gautam Bhattacharyya (Saha Inst. of Nucl. Phys., Kolkata)
Date: May 13, 2015
29. "The early evolution of the Milky Way's satellite system in CDM cosmology"
Speaker: Gerhard Hensler (U Vienna/ NAOJ)
Date: May 14, 2015
30. "Cohomological Fourier-Mukai transforms of abelian varieties"
Speaker: Dulip Piyaratne (Kavli IPMU)
Date: May 14, 2015
31. "Combining imaging and spectroscopy to reveal the hidden universe"
Speaker: Jeffrey Newman (U Pittsburgh)
Date: May 19, 2015
32. "Recent topics in rigorous proof of quark confinement"
Speaker: Keiichi Ito (Rikkyo U)
Date: May 20, 2015
33. "Towards understanding UV aspects of gravity"
Speaker: Anupam Mazumdar (Lancaster U)
Date: May 20, 2015
34. "Some explorations of a holographic Kondo model: quantum quench and entanglement entropy"
Speaker: Jackson Wu (NCTS Hsinchu)
Date: May 21, 2015
35. "Prospects of galaxy cluster studies with ASTRO-H"
Speaker: Tetsu Kitayama (Toho U)
Date: May 21, 2015
36. "How Bayesian Statistics Are Different And Better"
Speaker: Ed Turner (Princeton U)
Date: May 26, 2015
37. "MaNGA: how to run a successful survey (and not die trying)"
Speaker: Jose Sanchez-Gallego (U Kentucky)
Date: May 26, 2015
38. "Higgs physics as a probe of electroweak baryogenesis"
Speaker: Eibun Senaha (NCU)
Date: May 27, 2015
39. "Antineutrino Results from T2K"
Speaker: Roger Wendell (ICRR)
Date: May 27, 2015
40. "Star formation, gas and the ISM of high-z starburst galaxies"
Speaker: John Silverman (Kavli IPMU):
Date: May 28, 2015
41. "Horava gravity: Suppressing the Lorentz violations in the matter sector"
Speaker: A. Emir Gumrukcuoglu (U Nottingham)
Date: May 29, 2015
42. "From Massive Gravity to Bigravity and back"
Speaker: Matteo Fasiello (Stanford U)
Date: Jun 01, 2015
43. "A Zoo of Bayesian Priors"
Speaker: Ed Turner (Princeton U)
Date: Jun 02, 2015
44. "Holographic vortex pair annihilation in superfluid turbulence"
Speaker: Hongbao Zhang (VUB Brussels)
Date: Jun 02, 2015
45. "Inflationary Tensor Fossils in CMB and LSS"
Speaker: Emanuela Dimastrogiovanni (Arizona State U)
Date: Jun 03, 2015
46. "Dark Matter Dynamics"
Speaker: Tom Abel (Stanford U)
Date: Jun 03, 2015
47. "Obtaining and Understanding Bayesian Posteriors"
Speaker: Ed Turner (Princeton U)
Date: Jun 04, 2015
48. "Nuclear and host properties of local and distant radio galaxies (FRO-FRI-FRII): similarities and

- differences”
 Speaker: Ranieri Baldi (Technion in Israel)
 Date: Jun 08, 2015
49. “Practical and Philosophical Problems with Bayesian Statistics”
 Speaker: Ed Turner (Princeton U)
 Date: Jun 09, 2015
50. “4D $N=2$ Galois symmetries”
 Speaker: Michele del Zotto (Harvard U)
 Date: Jun 11, 2015
51. “(Hsi-An Pan) What is a Giant Molecular Cloud? Are Observers and Simulators Discussing the Same Star-forming Clouds? (Alex Pettit) Armed and/or dangerous: the sensitivity of galactic spiral generation in tidal encounters”
 Speaker: Hsi-An Pan & Alex Pettit (Hokkaido U)
 Date: Jun 11, 2015
52. “A new approach to simulation of collisionless fluids (dark matter)”
 Speaker: Oliver Hahn (Université de Nice)
 Date: Jun 12, 2015
53. “ACM bundles and derived categories of cubic hypersurfaces.”
 Speaker: Marti Lahoz (Université Paris)
 Date: Jun 15, 2015
54. “Moonshine and Sigma Models”
 Speaker: John F. Duncan (Case Western U)
 Date: Jun 16, 2015
55. “Thermalization after Inflation”
 Speaker: Kyohei Mukaida (Kavli IPMU)
 Date: Jun 17, 2015
56. “Correlation Functions in Stochastic Inflation”
 Speaker: Vincent Vennin (Portsmouth U)
 Date: Jun 23, 2015
57. “Modelling the Milky Way Bar”
 Speaker: Shude Mao (Tsinghua

U / NAOJ Chinese Academy of Sciences)
 Date: Jun 25, 2015

58. “Scaling laws for thermo-electric transport at quantum criticality”
 Speaker: Andreas Karch (U Washington)
 Date: Jun 30, 2015

Personnel Changes

Reappointment

Takahiro Nishimichi has appointed as a Kavli IPMU Assistant Professor on April 1, 2015. He had been at the Kavli IPMU from April 1, 2010 to March 31, 2013 as a Todai Postdoctoral Research Fellow (JSPS Postdoctoral Fellow). He then stayed at the Institut d’Astrophysique de Paris (IAP) for two years under the support of JSPS Postdoctoral Fellowship for Research Abroad Program. Nishimichi says he is excited to return to the Kavli IPMU. “I have been working on gravitational evolution of cosmic structures, and, more practically, cosmological information in galaxy clustering. At the Kavli IPMU, I would like to establish ‘big-data cosmology’ based on next generation survey projects, such as SuMIRe on Subaru, by exploiting advanced techniques in computational science and statistics.”



Takahiro Nishimichi

Expiration of Joint Appointments

Professor Yasunori Nomura at the University of California, Berkeley was jointly appointed as a Kavli IPMU Professor on January 1, 2015. This joint appointment expired on May 6, 2015.

Professor Edwin L. Turner at Princeton University was jointly appointed as a Kavli IPMU Professor

on March 6, 2015. This joint appointment expired on June 30, 2015.

Moving Out

Kavli IPMU Postdoctoral Fellow Ivan Chi-Ho Ip has moved to the Graduate School of Science, Kyoto University as an Assistant Professor. He was with the Kavli IPMU from 16 August, 2012 to May 15, 2015.

Kavli IPMU Postdoctoral Fellow Haruki Nishino has moved to the Institute of Particle and Nuclear Studies, High Energy Accelerator Research Organization as an Assistant Professor. He was with the Kavli IPMU from 1 April, 2013 to April 30, 2015.