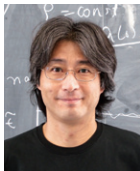


News

Hitoshi Murayama Named One of the 100 Influencers in the World

It has been 100 years since Albert Einstein established the General Theory of Relativity in 1915 and published it in 1916. To commemorate this historic milestone, the Albert Einstein Foundation is promoting the Einstein Legacy Projects. “Genius: 100 Visions of the Future” is one of these projects. It aims at collecting and publishing the visions of 100 significant influencers in the world including scientists, artists, thinkers, and innovators. Kavli IPMU Director Hitoshi Murayama has been named by the Foundation as one of the contributors for this project. Those already on the list include Kyoto University Professor and Nobel Laureate Shinya Yamanaka. The 100 visions will be compiled into the world’s first 3D-printed book featuring Einstein’s face, designed by the world-famous designer, Israel-born Ron Arad.



Hitoshi Murayama

PI Young-Kee Kim Elected to the American Academy of Arts and Sciences

On April 12, 2017, it was announced that Chicago University Professor and Kavli IPMU Principal Investigator (PI) Young-Kee Kim was

named a new member of the American Academy of Arts and Sciences. Established in 1780, it is one of the oldest learned societies



Young-Kee Kim

in the United States. Its members have made significant accomplishments in academia, arts, business, and politics, and selection by the Academy has been one of the highest honors in the United States. So far, three Kavli IPMU members have been selected by the Academy as its members: PI David Spergel in 2012, Director Hitoshi Murayama in 2013, and PI Hiroshi Ooguri in 2016.

Professor Young-Kee Kim has long been a leading physicist in the field of high-energy physics experiments using particle accelerators. Her research activities include participation in the CDF experiment at Fermilab in the US and the ATLAS experiment at the CERN LHC. She also served as Deputy Director of Fermilab from 2006 to 2013.

The 228 new members announced this year will be inducted at a ceremony at the Academy’s headquarters in Cambridge, Massachusetts on October 7.

Kavli IPMU and ICRR Host 16th Joint Public Lecture

On April 15, 2017, the 16th Kavli IPMU and University of Tokyo’s Institute for Cosmic Ray Research (ICRR) joint public lecture was held at Amuser Kashiwa in Kashiwa city, and about 330 audience including junior high-school and high-school students participated.

ICRR Professor Hiroyuki Sagawa delivered the first lecture, entitled “The Highest Energy Cosmic Rays — Probing Extremely High-Energy Astrophysical Phenomena from Utah,”

where he talked about the Telescope Array (TA) experiment carried out in a Utah desert. (For the highest-energy cosmic rays which are the objects of observation in the TA experiment, see *Kavli IPMU News* No. 27, p. 28.) Professor Sagawa explained that there are various hypotheses about the origin of the highest-energy cosmic rays, and the TA experiment uses two kinds of instruments, a ground array of scintillator surface detectors and fluorescence telescopes, to observe arrival directions and energies of cosmic rays, which are clues to distinguish these hypotheses. He also explained that the instruments of the TA experiment are deployed over a 700 km² area of the Utah desert, and in the TA’s future plan, a 3000 km² area is envisaged. The audience seemed to be astonished at such a large scale.

The next lecture was delivered by Kavli IPMU Associate Professor Yukinobu Toda. He spoke on “Calabi-Yau Manifolds—Mathematical ‘Conjectures’ Introduced by Physics.” Calabi-Yau manifolds are manifolds which attract a great deal of attention at the intersection between string theory in physics and pure mathematics. To explain what the Calabi-Yau Manifolds are, Professor Toda gave careful and stepwise illustrations of *dimensions*, *polynomial expressions*, *complex numbers*, *complex algebraic varieties*, and so on, while talking about the history of a field of mathematics developed in



Yukinobu Toda, giving a lecture.

Japan, “the classification of higher-dimensional complex algebraic varieties.”

He then talked about how the Calabi-Yau manifolds, known to mathematicians as interesting manifolds, came to be connected with physics when physicists discovered mirror symmetry, and how mathematician’s interests in superstring theory led to the mathematical discovery of the equivalence of two different mathematical theories thanks to mirror symmetry.

After the lectures, Professor Sagawa and Professor Toda answered each other’s questions. They also answered some of the written questions that the audience submitted during the break. There was then a further opportunity for attendees to ask the lecturers questions in the foyer of Amuser Kashiwa.



Yukinobu Toda (left) and Hiroyuki Sagawa (right)

First Lecture at Science Café Universe 2017

Since 2009, Kavli IPMU and Tamarokuto Science Center has been co-hosting “Science Café Universe” at Tamarokuto Science Center in Nishi-Tokyo City. Every year, a series of two or three Science Cafés, with the exception of 2009 when there were five, has been held on Saturdays over a month or two. This year, the first Science Café in the 2017 series was held on June 24. Here, for the first time a non-Japanese researcher, Kavli IPMU postdoctoral fellow William

Donovan delivered a lecture in English with no interpretation in Japanese. The second of the 2017 series will be held on July 8 in the same way.



Will Donovan, giving a lecture.

The title of Donovan’s lecture was “Soap Bubbles, Spacetime, and Structures.” There were about 30 attendees, about 30% of whom were junior high-school and high-school students. In the first half of the Science Café, each group of attendees made an experiment to generate soap bubbles using a hand-made soap bubble making kit and soap bubble liquid, for the purpose of understanding curvature. The lecturer explained that soap bubbles have surprising shapes and the shape of a soap bubble is set by simple equations. He then proceeded to Gaussian curvature, the bending of space and time, and Einstein’s equation for general relativity. The attendees seemed to be quite interested in the fact that there is a link between soap bubbles and the universe in terms of the mathematical concept of curvature.

Although only English was used throughout this Science Café, from the lecture to the Q&A session, one of the attendees remarked on the questionnaire, “As the lecture was given in English only, I was initially bracing myself for it. But because the lecturer spoke English in an easy-to-understand way, I was able to follow his lecture. And it was interesting.” There were other similar remarks.

Generally, the attendees seemed to be satisfied.



Will Donovan, answering questions of attendees after the lecture.

Kavli IPMU Seminars

1. “Theoretical Models for Hydrogen-poor Superluminous Supernovae”
Speaker: Elena Sorokina (Moscow State U)
Date: Feb 01, 2017
2. “Ultraluminous quasars with the most massive black holes at cosmic dawn”
Speaker: Xue-Bing Wu (KIAA, Peking U)
Date: Feb 02, 2017
3. “Curves and cycles on K3 surfaces”
Speaker: Qizheng Yin (ETH Zurich)
Date: Feb 07, 2017
4. “Dark Matter interpretation of the IceCube diffuse neutrino flux”
Speaker: Marco Chianese (U Naples)
Date: Feb 08, 2017
5. “Higher Dimensional Quantum Theories”
Speaker: Kimyeong Lee (KIAS)
Date: Feb 14, 2017
6. “Ultra-Light Axion Dark Matter and its impacts on dark halo structure in N-body simulation”
Speaker: Yue-Lin Sming Tsai (NCTS, Taiwan)
Date: Feb 15, 2017
7. “Simulating nonlinear cosmological structure formation with massive neutrinos”
Speaker: Arka Banerjee (UIUC)
Date: Feb 15, 2017

8. "Characteristic polynomials of Linnear arrangements"
Speaker: Masahiko Yoshinaga (Hokkaido U)
Date: Feb 16, 2017
9. "Splashback and outskirts of Dark Matter halos"
Speaker: Susmita Adhikari (UIUC)
Date: Feb 16, 2017
10. "On geometric invariant theory for hypersurfaces and their hyperplane sections"
Speaker: Patricio Gallardo (U Georgia)
Date: Feb 21, 2017
11. "On quantized elliptic algebras"
Speaker: Yoshihisa Saito (U Tokyo)
Date: Feb 21, 2017
12. "A (The?) Higgs Vacuum Instability During Inflation"
Speaker: Jack Kearney (FNAL)
Date: Feb 22, 2017
13. "Nucleosynthesis of heavy elements in the r-process"
Speaker: Igor Panov (ITEP)
Date: Feb 22, 2017
14. "The Degeneracy of Cosmic Neutrinos"
Speaker: Ming-Chung Chu (Chinese U of Hong Kong)
Date: Feb 23, 2017
15. "The Thirty Meter Telescope - India Perspective"
Speaker: Anupama Chakrapani (Indian Institute of Astrophysics)
Date: Feb 23, 2017
16. "Algebraic Cycles and Modular Forms"
Speaker: Marc-Hubert Nicole (Institut mathématique de Marseille)
Date: Feb 24, 2017
17. "Top and Top+Charm Flavored Scalar Dark Matter with a Vector-like Fermion Partner"
Speaker: Peiwen Wu (KIAS)
Date: Feb 24, 2017
18. "Non-perturbative analysis of the spectrum of meson resonances in an ultraviolet-complete composite-Higgs model"
Speaker: Michele Frigerio (CNRS)
Date: Mar 01, 2017
19. "Superconformal index of Argyres-Douglas theories of class S"
Speaker: Takahiro Nishinaka (Kyoto U)
Date: Mar 07, 2017
20. "The interplay between the primordial magnetic fields and particle physics"
Speaker: Kohei Kamada (Arizona State U)
Date: Mar 08, 2017
21. "Langlands conjecture for function fields via shtukas"
Speaker: Dennis Gaitsgory (Harvard U)
Date: Mar 13, 2017
22. "Cosmology with Shadows in the Microwave Sky"
Speaker: Nick Battaglia (Princeton U)
Date: Mar 13, 2017
23. "The Influence of Galaxy Environment on the Stellar Initial Mass Function of Early-Type Galaxies"
Speaker: Giulio Rosani (ARI Heidelberg)
Date: Mar 14, 2017
24. "Factorization homology and the cobordism hypothesis"
Speaker: John Francis (Northwestern U)
Date: Mar 14, 2017
25. "Langlands conjecture for function fields via shtukas"
Speaker: Dennis Gaitsgory (Harvard U)
Date: Mar 15, 2017
26. "How environment chisels galaxy properties: the clusters galaxies' outlook"
Speaker: Anna Pasquali (ARI Heidelberg)
Date: Mar 16, 2017
27. "Mass growth of objects and categorical entropy"
Speaker: Akishi Ikeda (Kavli IPMU)
Date: Mar 16, 2017
28. "Langlands conjecture for function fields via shtukas"
Speaker: Dennis Gaitsgory (Harvard U)
Date: Mar 17, 2017
29. "The new relationship between inflation and gravitational waves"
Speaker: Tomohiro Fujita (Stanford U)
Date: Mar 21, 2017
30. "OzDES - Spectroscopic follow-up of transients and other objects in the DES supernova fields"
Speaker: Chris Lidman (Australian Astronomical Observatory)
Date: Mar 21, 2017
31. "Axion dark matter in the post-inflationary Peccei-Quinn symmetry breaking scenario"
Speaker: Kenichi Saikawa (DESY)
Date: Mar 22, 2017
32. "On magnetic field generation in stars"
Speaker: Elena Popova (Moscow State U)
Date: Mar 22, 2017
33. "New Ways to Study Magnetic Fields and Turbulence using Observations"
Speaker: Alex Lazarian (U Wisconsin)
Date: Mar 23, 2017
34. "Multiple Higgs production at very high energies (and meltdown of perturbation theory)"
Speaker: Valya Khoze (IPPP, Durham U)
Date: Mar 29, 2017
35. "The Boundary Dual of a Local Bulk Operator"
Speaker: Sean Jason Weinberg (UCSB)
Date: Mar 30, 2017

36. "Mapping the $z > 2$ Cosmic Web with IGM Tomography: Latest Results and Future Perspectives"
Speaker: Khee-Gan Lee (LBL)
Date: Mar 30, 2017
37. "Equations and derived manifolds"
Speaker: Andrew Macpherson (Kavli IPMU)
Date: Mar 30, 2017
38. "Analysing the 21cm signal from epoch of reionization with artificial neural networks"
Speaker: Hayato Shimabukuro (Observatoire de Paris)
Date: Mar 31, 2017
39. "Effective Field Theory for the Standard Model"
Speaker: Rodorigo Alonso De Pabio (CERN)
Date: Apr 03, 2017
40. "Quantum Aspects of Black Holes"
Speaker: Dieter Luest (MPI)
Date: Apr 04, 2017
41. "Simplified models of dark matter with a long-lived co-annihilation partner"
Speaker: Alexis Plascencia (IPPP, Durham)
Date: Apr 05, 2017
42. "The Thin Flux-Tube Approximation and Some Applications in Solar/Stellar Magnetism"
Speaker: Antonio Ferriz (IAA/CSIC Granada and Universidad de Vigo, Spain)
Date: Apr 06, 2017
43. "Direct dark matter search with the XMASS detector"
Speaker: Katsuki Hiraide (ICRR)
Date: Apr 07, 2017
44. "Supercritical Entanglement: counter-examples to the area law for quantum matter"
Speaker: Ramis Movassagh (IBM TJ Watson Reserach Center)
Date: Apr 10, 2017
45. "Cohomological BPS invariants, vanishing cycles and Kac-Moody Lie algebras"
Speaker: Ben Davison (U Glasgow)
Date: Apr 10, 2017
46. "Superposition induced topology changes in quantum gravity"
Speaker: David Berenstein (UCSB)
Date: Apr 11, 2017
47. "Dark Matter and Collider Studies in the L-R Symmetric Standard Model with Vector like leptons"
Speaker: Dilip Kumar Ghosh (Indian Association for the Cultivation of Science)
Date: Apr 12, 2017
48. "Moving the CFT into the Bulk"
Speaker: Herman Verlinde (Princeton U)
Date: Apr 13, 2017
49. "From Precision to Accuracy: cosmology with large imaging surveys"
Speaker: Boris Leistedt (NYU)
Date: Apr 13, 2017
50. "Hunting for Dark Matter with SuperCDMS"
Speaker: Tsuguo Aramaki (SLAC)
Date: Apr 14, 2017
51. "How to resum perturbative series in supersymmetric gauge theories"
Speaker: Masazumi Honda (Weizmann Institute of Science)
Date: Apr 18, 2017
52. "Searching for dark matter with liquid xenon"
Speaker: Masaki Yamashita (ICRR)
Date: Apr 18, 2017
53. "Standard Model Parton Distributions at Very High Energies"
Speaker: Bryan Webber (U Cambridge)
Date: Apr 19, 2017
54. "Homotopy Lie algebroids and bialgebroids"
Speaker: Alexander Voronov (U Minnesota)
Date: Apr 20, 2017
55. "Dynamical Clockwork axions"
Speaker: Rupert Coy (U. Montpellier)
Date: Apr 21, 2017
56. "You can hide but you have to run: new theory tools to unveil the mystery of dark matter"
Speaker: Francesco D'Eramo (UC Santa Cruz)
Date: Apr 26, 2017
57. "Magnetic fields of primordial origin"
Speaker: Ryo Namba (McGill U)
Date: Apr 28, 2017

Personnel Changes

Reappointment

Former Kavli IPMU Postdoctoral Fellow Yin Li has been reappointed on April 1, 2017. Previously, he was at the Kavli IPMU from April 1 to September 30, 2016. He then stayed at Lawrence Berkeley National Laboratory (LBNL) for half a year. For the time being, he will alternately work at the Kavli IPMU and LBNL for half a year each.

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 Christophe Bronner [May 1, 2014 – April 30, 2017] moved to the Kamioka Observatory of the Institute for Cosmic Ray Research, the University of Tokyo as a Project Assistant Professor.

Kavli IPMU Postdoctoral Fellow Yohsuke Imagi [June 1, 2014 – June 15, 2017] moved to the Chinese University of Hong Kong as a Postdoctoral Fellow.