

# News

## Kavli IPMU Signs MOU with The Institute of Statistical Mathematics

The Institute of Statistical Mathematics (ISM) and the Kavli IPMU agreed to broaden research collaborations during an MOU signing on January 5, 2016. Kavli IPMU Director Hitoshi Murayama, Professor Naoki Yoshida, and ISM Director-General Tomoyuki Higuchi were present on the day. Both institutes have already been collaborating on a Japan Science and Technology Agency CREST (Core Research for Evolutional Science and Technology) project “Statistical Computational Cosmology with Big Astronomical Imaging Data” (Research Director: Naoki Yoshida), which started in October 2014. The new partnership will drive development of a new field of statistical computational cosmology.



Kavli IPMU Director Murayama and ISM Director-General Higuchi signing the MOU, with the presence of Professor Yoshida.

## Kavli Foundation Science Program Team Visits Kavli IPMU

Kavli Foundation Executive Vice President and Science Program team

leader Miyoung Chun, and Science Program Directors Christopher Martin and Sharif Taha visited the Kavli IPMU on January 18, 2016. The guests first heard 30 minute presentations from Kavli IPMU Professor Masashi Hazumi, Professor Masahiro Takada, Professor Mark Vagins, and University of Tokyo's School of Science Associate Professor and Kavli IPMU Scientist Yuji Tachikawa. Following this, five minute presentations were given by Kavli IPMU Postdoctoral Fellows Teppei Okumura, Dulip Piyaratne, Ran Huo, Yuki Moritani, James Wallbridge, Itamar Yaakov, and Lluís Magro.

The guests enjoyed taking part in tea time before listening to Kavli IPMU Director Hitoshi Murayama's talk about the latest developments at the institute, and ending with a dinner with researchers.



Masashi Hazumi presenting research activities.

## Researchers Find Galaxy Cluster Environment Not Dictated by Its Mass Alone

An international group of researchers including Kavli IPMU Assistant Professor Surhud More, Professor Masahiro Takada, NASA Jet Propulsion Laboratory / California Institute of Technology Researcher Hironao Miyatake (formerly a JSPS Fellow at the Kavli IPMU), and Princeton University Professor and Kavli IPMU Principal Investigator David Spergel divided almost 9000 galaxy clusters from the Sloan Digital Sky Survey DR8 galaxy catalog into two samples based on the spatial

distribution of galaxies inside each cluster (on an order of 1 million light years scale).

By using gravitational lensing they confirmed the two samples have similar masses, but that the distribution of clusters was different, and the difference is a result of the different dark matter environment in which they formed. Galaxy clusters in which member galaxies bunched up towards the center were less clumpy than clusters in which member galaxies were more spread out. They found the total amount of dark matter extending to an order of 100 million light year scale around the member of the former sample of galaxy clusters was about 1.5 times less than that around the member of the latter sample.

Their findings showed for the first time that the connection between a galaxy cluster and surrounding dark matter is not characterized solely by the mass of clusters, but also by their formation history. The results were published in *Physical Review Letters* on January 25, 2016 as an Editor's Suggestion.

## Magnetar Could Have Boosted Explosion of Extremely Bright Supernova

A group of researchers led by Melina Bersten, Researcher at Instituto de Astrofísica de La Plata, Universidad Nacional de La Plata in Argentina and Kavli IPMU Visiting Associate Scientist, and including Kavli IPMU Principal Investigator Ken'ichi Nomoto, tested a model that suggests that the energy to power the luminosity of two recently discovered unusual super-luminous supernovae, SN 2011kl and ASASSN-15lh, is mainly due to the rotational energy lost by a newly born rapidly rotating and strongly

magnetized neutron star called a *magnetar*.

For more details, see page 26 of this issue of the Kavli IPMU News. The group's paper was published in *Astrophysical Journal Letters* on January 20, 2016.

### Honors at the 2015 UTokyo President's Special Award for Operational Improvement

For their part in improving international researcher support, Kavli IPMU International Relations and Researcher Support Section members, Rieko Tamura and Hisami Kuboshima, were commended at the 2015 University of Tokyo President's Special Award for Operational Improvement on December 18, 2015, held at the Yasuda Auditorium on the university's Hongo campus. Tamura and Kuboshima were part of a strategy team led by Midori Ozawa, Specialist at the International Affairs Department's International Planning Group, and including two members from that Group. The team developed a website designed to help university staff and overseas researchers understand the paperwork needed when coming to Japan. The website uses many features used at the Kavli IPMU, and it is hoped these will spread across the university and improve globalization.

The team leader Midori Ozawa served as Head of the Kavli IPMU



University of Tokyo President Gonokami (front row center) and all the recipients of 2015 University of Tokyo President's Awards for Operational Improvement

International Relations and Researcher Support Section since its launch in October 2007 to March 2014.

### Nobel Prize in Physics Commemorative Lectures for the UTokyo Students and Personnel

Around 600 students and university personnel crowded into the University of Tokyo's Yasuda Auditorium in the evening of January 18, 2016, to commemorate Institute for Cosmic Ray Research Director and Kavli IPMU Principal Investigator Takaaki Kajita on receiving the 2015 Nobel Prize in Physics. The event was broadcast live to a total of five places on the Hongo, Komaba, and Kashiwa campuses and the Kamioka Observatory. University of Tokyo President Makoto Gonokami started by announcing Professor Kajita would be the fifth person in the university's history to be given the title Special University Professor/Professor Emeritus. Following this was a talk by Kavli IPMU Director Hitoshi Murayama titled "Our Father, Neutrinos," and another by Professor Kajita titled "Discovery of Neutrino Mass." Professor Kajita made it a personal presentation, describing the moment he realized his analysis of Kamiokande's atmospheric neutrino data was indicating neutrino oscillations, to moving from Kamiokande to Super-Kamiokande, and finally discovering neutrino oscillations. To finish the night, Professor Kajita was given a bouquet of flowers, and a special message board representing Super-Kamiokande and filled with messages from fellow faculty members and students.

### Kavli IPMU Opens "Takaaki Kajita Nobel Prize Commemorative Lecture Series"

As part of the University of Tokyo's

celebrations in commemorating Takaaki Kajita's Nobel Prize in Physics, the Kavli IPMU hosted a public event titled, "Where do we come from? – Beyond the Nobel Prize in Neutrinos" at the Yasuda Auditorium on March 27, 2016.

About 470 people came to hear about the latest developments in neutrino research from a theoretical and experimental perspective, with Kavli IPMU Director Hitoshi Murayama talking about "Neutrinos as our father who protected us from a complete annihilation," and Professor Mark Vagins talking about "Supernovae as our mother who gave birth to the elements of nature." The audience was most excited when Professor Vagins explained how last year, permission was granted within the Super-Kamiokande collaboration to inject gadolinium into the Super-Kamiokande's pure water in order to begin a new project to detect supernova relic neutrinos. The event was a great success in introducing the future of research in the field.

The next lecture in this event series will be cohosted by the School of Science and the Institute for Cosmic Ray Research on April 24.



Mark Vagins giving a talk.

### Kavli IPMU and ELSI Host Joint Public Lecture "Question of Origins"

For the first time, two WPI (World Premier International Research Center Initiative) centers studying "origins," the Kavli IPMU and Tokyo Institute of Technology's Earth-Life Science

Institute (ELSI), hosted a public event presenting the latest developments in research, and discussing the question about origins using philosophy. WPI Program Director Toshio Kuroki opened the event on January 10, 2016, where 300 people came to the Miraikan (The National Museum of Emerging Science and Innovation) in Odaiba, Tokyo to hear Kavli IPMU Director Hitoshi Murayama's talk "The Origin of the Universe and the Birth of Stars," and ELSI Director Kei Hirose's talk "The Origin of Earth and the Birth of Life," and lastly University of Tokyo Center for Philosophy Director Shinji Kajitani's talk "Genealogy of Science and World Views – Historical Meaning behind Human Existence." Afterwards, the three speakers took part in a round table "What Does It Mean to Question Origins?" The event ended with conversations between the lecturers and the audience.



From left to right: Kei Hirose, Hitoshi Murayama, and Shinji Kajitani.

### Kavli IPMU Hosts "East and West Views of the Universe"

The Kavli IPMU lecture hall reached full capacity on March 20, 2016, when the institute hosted the public lecture "East and West Views of the Universe." To begin with, University of California, Berkeley Professor and Kavli IPMU Visiting Senior Scientist Yasunori Nomura gave a talk titled, "Multiverse Theory – The Universe as Explained by Theoretical Physics." Then, Chinese philosophy expert and Institute for Advanced Studies on

Asia, the University of Tokyo Professor Takahiro Nakajima gave a talk titled, "The Ins and Outs of Cosmologia – Imagination of China's Theory of the Universe." Following the talks, both speakers discussed the East and West views of the Universe, and how physicists and philosophers regard the cosmos. The day ended with tea time, where speakers and members of the audience crowded around one another with tea and coffee, asking more questions and discussing ideas.



Yasunori Nomura (left) and Takahiro Nakajima (right) discussing.

### Taking Part in the AAAS Annual Meeting

This year's American Association for the Advancement of Science (AAAS) Annual Meeting (February 11 – 15) was held in Washington, D.C. MEXT, JSPS, and the nine WPI centers took part in it and jointly hosted the WPI booth for three days (February 12 – 14) to further promote the research being carried out at each WPI center to an international audience. For the first time, questionnaires were handed out at the WPI booth in order to see how much the American public was aware of the program. The results revealed that the Kavli IPMU was the most well-known among visitors. During three days, the WPI booth was visited by more than 320 people including researchers, journalists, students, and families.

### Japanese Class Completion Ceremony

The Kavli IPMU has been offering Japanese classes to researchers and

their families. To date, a lot of people have completed their 40 hours of Introductory Japanese Course taught by Kavli IPMU's Japanese Language teacher Masami Nishikawa.

This time, four students celebrated finishing their Japanese classes on March 29, 2016, and received their certificates. They are Kavli IPMU Postdoctoral Fellows David Stark, Luo Feng, Han Chengcheng, and Kavli IPMU Academic Support Staff Joshua Speagle's fiancée Rebecca Bleich.



Photo of four Japanese class students having their certificates, with Japanese Language teacher Masami Nishikawa (back row, second from the right) and other attendants.

### Kavli IPMU Seminars

1. "Supersymmetric Casimir Energy and the Anomaly Polynomial"  
Speaker: Hee-Cheol Kim (Perimeter Inst)  
Date: Dec 15, 2015
2. "Some Examples of Projective 4-Folds with Primitive Automorphisms of Positive Entropy"  
Speaker: Keiji Oguiso (U Tokyo)  
Date: Dec 21, 2015
3. "Affleck-Dine Sneutrino Inflation & SU(5) Grand Unification in Pure Gravity Mediation"  
Speaker: Jason Evans (KIAS)  
Date: Dec 24, 2015
4. "Exponential Networks and BPS State Counting"  
Speaker: Richard Eager (U Heidelberg)  
Date: Dec 29, 2015
5. "Phenomenology of vectorlike lepton extensions of the SM or two

- Higgs doublet model”  
Speaker: Seodong Shin (Indiana U)  
Date: Jan 06, 2016
6. “Four dimensional N=2 SCFT and singularity theory”  
Speaker: Dan Xie (Harvard U)  
Date: Jan 07, 2016
7. “The role of General Relativity and stellar tides in few-body interactions involving stars, neutron stars, white-dwarfs and black holes”  
Speaker: Johan Samsing (Princeton U)  
Date: Jan 07, 2016
8. “Homological projective duality for  $Sym^2 P^n$ ”  
Speaker: Jorgen Rennemo (ASC Oxford)  
Date: Jan 12, 2016
9. “Hamiltonian approaches to strongly coupled quantum field theory”  
Speaker: Slava Rychkov (CERN & U Paris 6)  
Date: Jan 13, 2016
10. “Exact quantization conditions for relativistic integrable systems”  
Speaker: Yasuyuki Hatsuda (U Geneva)  
Date: Jan 14, 2016
11. “Type II-P supernovae as primary distance indicators in cosmology”  
Speaker: Petr Baklanov (ITEP Moscow)  
Date: Jan 14, 2016
12. “Dark Matter Searches with Neutrinos”  
Speaker: Carsten Rotts (Sungkyunkwan U)  
Date: Jan 19, 2016
13. “Wormholes, Emergent Gauge Fields, and the Weak Gravity Conjecture”  
Speaker: Daniel Harlow (Center for the Fundamental Laws of Nature, Harvard U)  
Date: Jan 19, 2016
14. “P-functors”  
Speaker: Timothy Logvinenko (Cardiff U)  
Date: Jan 19, 2016
15. “A Charged Membrane Paradigm at Large D”  
Speaker: Mangesh Mandlik (TIFR)  
Date: Jan 20, 2016
16. “Physics of extended Higgs sectors”  
Speaker: Shinya Kanemura (Toyama U)  
Date: Jan 20, 2016
17. “Stars on death row”  
Speaker: Sam Jones (HITS)  
Date: Jan 20, 2016
18. “Contraction algebra and invariants of singularities”  
Speaker: Zheng Hua (U Hong Kong)  
Date: Jan 21, 2016
19. “Modeling Dynamic Phases in Stellar Evolution using Multidimensional Hydrodynamics Simulations”  
Speaker: Philipp Edelmann (HITS)  
Date: Jan 21, 2016
20. “Physics of the early universe using the measurement of comics microwave background polarization and path forward in next 15 years using a satellite”  
Speaker: Tomotake Matsumura (ISAS/JAXA)  
Date: Jan 22, 2016
21. “Stroll along the Walls with Python - BPS spectra of supersymmetric theories”  
Speaker: Chan Youn Park (Rutgers U)  
Date: Jan 25, 2016
22. “Comparison of LIGO / Virgo upper limits with predicted compact binary merger rates”  
Speaker: Chris Belczynski (Warsaw U)  
Date: Jan 27, 2016
23. “Probing the Early Universe: Innovative Approaches in Millimeter Wavelength Cosmology”  
Speaker: Abby Crites (Caltech)  
Date: Jan 28, 2016
24. “Phenomenology of low-energy flavour models: rare processes and dark matter”  
Speaker: Lorenzo Calibbi (Chinese Academy of Sciences)  
Date: Feb 02, 2016
25. “A new spin on the stellar content of the Carina dSph galaxy”  
Speaker: Giuseppe Bono (U Rome Tor Vergata / U Tokyo)  
Date: Feb 03, 2016
26. “Towards the discovery of CP violation in neutrinos”  
Speaker: Hiro Tanaka (U British Columbia)  
Date: Feb 03, 2016
27. “Constrain Galaxy Formation Physics from Large-Scale Structure Measurements and Weak Lensing”  
Speaker: Ying Zu (CMU)  
Date: Feb 04, 2016
28. “The REsolved Spectroscopy Of a Local VolumE (RESOLVE) Survey and its Environmental COntext (ECO) Catalog”  
Speaker: Sheila Kannappan (U North Carolina)  
Date: Feb 04, 2016
29. “About the structure of the moduli space of Higgs pairs with nilpotent residues”  
Speaker: Denis Degtyarev (HSE, National Research U)  
Date: Feb 04, 2016
30. “Minimal Dark Matter, reloaded”  
Speaker: Marco Cirelli (LPTHE)  
Date: Feb 05, 2016
31. “A Holographic Study of Chern-Simons Defects”  
Speaker: Charles Melby-Thompson (Fudan U)  
Date: Feb 09, 2016
32. “6 vertex quantum integrable system and cohomology of Grassmanian”  
Speaker: Vassili Gorbounov (U Aberdeen)  
Date: Feb 10, 2016
33. “Surface defects as transfer matrices”



- Speaker: Junya Yagi (U Warsaw)  
Date: Feb 16, 2016
34. "The  $AdS_5 \times S^5$  String Field Theory vertex and integrability"  
Speaker: Romuald Janik (Jagiellonian U)  
Date: Feb 23, 2016
35. "Determinant line bundles, chiral fermions, and equivariant cohomology"  
Speaker: Xiaoyi Cui (U Göttingen)  
Date: Feb 25, 2016
36. "Counting open curves via closed curves"  
Speaker: Tony Yue YU (Institut de Mathématiques de Jussieu - Paris Rive Gauche)  
Date: Mar 01, 2016
37. "The Palomar Transient Factory and the Discovery of Incredibly Young Supernova"  
Speaker: Peter Nugent (LBNL)  
Date: Mar 02, 2016
38. "Study of double beta decay using  $ZnMoO_4$  cryogenic scintillating bolometers and  $^{116}CdWO_4$  crystal scintillators"  
Speaker: Cherniak Dmytro (Inst for Nuclear Research, Kyiv)  
Date: Mar 02, 2016
39. "Inflationary Magnetogenesis with Broken Local  $U(1)$  Symmetry"  
Speaker: Chunshan Lin (YITP)  
Date: Mar 04, 2016
40. "Mysteries in the Bootstrap"  
Speaker: David Poland (Yale U)  
Date: Mar 08, 2016
41. "LHC 750 GeV diphoton excess and some interpretations"  
Speaker: Jin Min Yang (ITP)  
Date: Mar 09, 2016
42. "The wild youth of galaxy clusters"  
Speaker: Emanuelle Daddi (CEA-Saclay)  
Date: Mar 10, 2016
43. "Future multi-objects spectrographs at ESO"  
Speaker: Vincenzo Maineri (ESO)  
Date: Mar 11, 2016
44. "Exact results for 5D supersymmetric theories on toric manifolds"  
Speaker: Maxim Zabzine (Uppsala U)  
Date: Mar 15, 2016
45. "Perspectives for Particle Physics beyond the Standard Model"  
Speaker: John Ellis (KCL)  
Date: Mar 16, 2016
46. "Hydrogen deficient peculiar supernovae"  
Speaker: Devendra Sahu (Indian Inst of Astrophysics, Bangalore)  
Date: Mar 17, 2016
47. "(Lecture 1) Supersymmetry and its breaking"  
Speaker: Nathan Seiberg (IAS)  
Date: Mar 21, 2016
48. "(Lecture 2) Supersymmetry and its breaking"  
Speaker: Nathan Seiberg (IAS)  
Date: Mar 22, 2016
49. "Where are we heading?"  
Speaker: Nathan Seiberg (IAS)  
Date: Mar 23, 2016
50. "(Lecture 3) Anomalies, conformal manifolds, and spheres"  
Speaker: Nathan Seiberg (IAS)  
Date: Mar 24, 2016
51. "Large-scale magnetic fields can explain the baryon asymmetry of the universe"  
Speaker: Tomohiro Fujita (Stanford U)  
Date: Mar 24, 2016
52. "(Lecture 4) On gapped boundary phases of topological phases"  
Speaker: Nathan Seiberg (IAS)  
Date: Mar 25, 2016
53. "Universal vertex algebras and free field realisations"  
Speaker: Simon Wood (ANU)  
Date: Mar 29, 2016
54. "Reheating and Primordial Gravitational Waves in Generalized Galilean Genesis"  
Speaker: Sakine Nishi (Rikkyo U)  
Date: Mar 30, 2016

## Personnel Changes

### Reappointment

Former Kavli IPMU Postdoctoral Fellow Wiphu Rujopakarn was reappointed on March 1, 2016

### 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 Shamik Banerjee [April 16, 2014 – February 29, 2016] moved to the Institute of Physics, Bhubaneswar in India as a Reader-Faculty.

Kavli IPMU Postdoctoral Fellow Kaori Hattori [July 1, 2015 – March 31, 2016] moved to the National Institute of Advanced Industrial Science and Technology as a Researcher.

Kavli IPMU Postdoctoral Fellow Tadashi Ishibe [April 1, 2015 – March 31, 2016] moved to the Graduate School of Mathematical Sciences, the University of Tokyo as a Postdoctoral Researcher.

Kavli IPMU Postdoctoral Fellow Yu Nakayama [September 1, 2015 – March 31, 2016] moved to Rikkyo University as an Associate Professor.

Kavli IPMU Postdoctoral Fellow Shun Saito [April 1, 2013 – March 31, 2016] moved to the Max Planck Institute for Astrophysics as a Postdoctoral Fellow.

Kavli IPMU Postdoctoral Fellow Yasuhiro Takemoto [April 1, 2014 – March 31, 2016] moved to the Research Center for Nuclear Physics, Osaka University as an Assistant Professor.

Also, Kavli IPMU Postdoctoral Fellow Amir Aazami resigned the Kavli IPMU at the expiration of his term, from January 16, 2013 to January 15, 2016.