

Toshiyuki Kobayashi Awarded the Medal with Purple Ribbon

On April 28, 2014, the Japanese government announced this spring's recipients of the Medal of Honor.



Toshiyuki Kobayashi

Toshiyuki Kobayashi, Professor at the Graduate School of Mathematical Sciences, the University of Tokyo, and Principal Investigator at the Kavli IPMU, was selected as a recipient of the Medal with Purple Ribbon in the field of mathematics. The Medal with Purple Ribbon is awarded to people who have made outstanding contributions in academic fields, the arts, and sports.

Professor Kobayashi's research is magnificent in scope, ranging from algebra to geometry and analysis, with a key word of "symmetry," and his achievements are influential in the whole area of mathematics. In particular, the following achievements received high recognition internationally and realized essential breakthroughs in mathematics: (1) Pioneering the theory of "discontinuous groups for homogeneous spaces beyond Riemannian geometry"; (2) Substantial breakthrough in the theory of "branching laws of infinite-dimensional representations,"

particularly, creating the theory of "discretely decomposable restrictions"; (3) Pioneering work on the "global analysis arising from minimal representations"; (4) Original theory of "visible action on complex manifolds" towards a unified theory of multiplicity-free representations.

Hiroshi Ooguri Appointed as the Founding Director of the Burke Institute

On May 14, 2014, the California Institute of Technology announced the establishment of the Walter Burke Institute for Theoretical Physics (Burke Institute) with Hiroshi Ooguri as its Founding Director. Ooguri has been Principal Investigator at the Kavli IPMU since October, 2007. The Burke Institute has been established with a \$75 million endowment, gifted by the Sherman Fairchild Foundation, where Walter Burke served for 35 years as president, and by other funders, aiming to promote research, and to nurture the next generation, in theoretical physics.

7th Meeting of the Kavli IPMU External Advisory Committee

On June 30, 2014, the seventh meeting of the Kavli IPMU External Advisory Committee was held with the attendance of all the committee members. This time, with the



Committee members: far side, from left to right, Nigel Smith (SNOLAB), Steve Kahn (Chair, Stanford Univ./SLAC), John Ellis (King's College London), Young-Kee Kim (Chicago Univ.), Sadanoti Okamura (Hosei Univ.), David Morrison (UC Santa Barbara), and Sadayoshi Kojima (Tokyo Tech)

submission deadline approaching about a half month ahead of the proposal for a five-year extension of the WPI funding after the initial ten years of support, the Committee gave many valuable suggestions for the content of the proposal and related issues.

Kavli IPMU Established an Endowed Research Unit

On April 1, 2014, the Kavli IPMU, Todai Institutes for Advanced Study, the University of Tokyo, and Hamamatsu Photonics K.K. established the Endowed Research Unit: Dark side of the Universe. This is the first endowed research unit for the field of fundamental science, such as elementary particle physics and cosmology, in the University of Tokyo.

Kavli IPMU Professor Ken'ichi Nomoto, who is famous internationally for his achievements in the research of supernovae and is a recipient of a Japan Academy award, assumed the post of Hamamatsu Professor in the unit. He leads diverse research projects related to dark energy, dark matter, and supernovae.

Quimby's Team Found a Lens Galaxy Magnifying a Type Ia Supernova

A supernova is a tremendously luminous object caused by a stellar explosion. Among various types of supernovae, those classified as type Ia (SNIa) have strikingly similar peak luminosities, and this property allows astronomers to use SNIa as standard candles to measure cosmological distance. However, PS1-10afx, a supernova observed at a distance of about 9 billion light years from the Earth was much more luminous than the normal SNIa, though it showed other properties almost identical

to those of SNIa. So, this was a big puzzle.

Last year, as reported in the June 2013 issue of the *Kavli IPMU News* (see No. 22, page 33), a team of researchers at the Kavli IPMU including Robert Quimby and Marcus Werner published the argument that PS1-10afx is a type Ia supernova 30 times magnified by a strong gravitational lens effect due to a massive galaxy (lens galaxy) existing in front of the PS1-10afx; the lens galaxy warps space-time to form magnified images of the supernova.

A question remained as where the lens galaxy is located, however, because, observed from the Earth, the lens galaxy overlaps with the host galaxy wherein the supernova appeared; the existing data do not allow us to separate the signal of the foreground lens galaxy from that of the host galaxy.

In September 2013, when the PS1-10afx sufficiently faded away, Quimby's team successfully extracted the light signal of the foreground galaxy in the glare of the relatively bright host galaxy, using the Low-Resolution Imaging Spectrograph on the Keck-I telescope located in Hawaii. This result confirmed the existence of the lens galaxy, which causes the lensing, between the host galaxy and us. The team reported this result in *Science*, a famous academic journal published by the American Association for the Advancement of Science (AAAS), on April 25, 2014. At



Press conference at the Sanjo Conference Hall

the same time, Quimby's team held a press conference at the University of Tokyo's Sanjo Conference Hall on the Hongo campus. The AAAS/Science side moderated the conference. The news was covered widely in the media internationally.

Freeman Dyson Visited Kavli IPMU

On April 15-19, 2014, Freeman Dyson visited the Kavli IPMU. He is a Professor Emeritus of the Institute for Advanced Study, famous for his outstanding achievements in various scientific fields, in particular, quantum electrodynamics. He is just over 90 years of age, and he is still actively engaged in science. Then, he visited the Kamioka Observatory of the Institute for Cosmic Ray Research / the Kamioka Branch of the Kavli IPMU on April 21-22, and in particular, Super-Kamiokande and other underground experiments.

In this issue of the *Kavli IPMU News*, you can find an interview (including a summary of the Q&A session) with him by Kavli IPMU Professor Masataka Fukugita, see pp. 22 - 30.



Freeman Dyson giving a lecture

10th ICRR-Kavli IPMU Joint Public Lecture "Decoding the Mystery of the Universe"

On April 12, 2014, the 10th ICRR (Institute for Cosmic Ray Research, The University of Tokyo)-Kavli IPMU joint public lecture, entitled "Decoding the Mystery of the Universe," was held at Amuser Kashiwa, which is located

near the JR Kashiwa station.

The first lecture was given by Toshitake Kohno, Professor at the Graduate School of Mathematical Sciences, the University of Tokyo and Kavli IPMU Principal Investigator, on "The Shape of the Universe ~ Mathematical Challenges." He talked about proposing models of the "shape of the Universe," which are in agreement with the observational data, using mathematics. Next, Vice-Director of ICRR, Professor Toshio Terasawa, gave a talk entitled "Shocking Universe ~ Universe Is Full of Shock Waves." He talked about the roles which strong shock waves, produced by explosive phenomena in the Universe, such as solar flares, supernovae, gamma-ray bursts, etc., play in the Universe.



Toshitake Kohno giving a lecture

Evening of Art and Live Music in Piazza Fujiwara

On April 25, two social groups of Kavli IPMU researchers and staff, the IPMU Chamber Orchestra and the Arts Society for the first time cohosted the *IPMUSIC+arts night*. On the 3rd floor of the Kavli IPMU Building, in front of the wall of the Piazza Fujiwara, on which 35 pictures contributed from Kavli IPMU researchers and staff with the theme, "Repetition, Scale, Duration" were exhibited, as many as 10 programs of musical performance, including the IPMU Chamber Orchestra's performance, and piano

solo, *koto* (traditional Japanese stringed musical instrument), *karaoke*, and singing and playing guitar, were presented by researchers and staff for 3 hours including a break. In Piazza Fujiwara, a great many researchers, staff, and their families and friends gathered, and they enjoyed the *IPMUSIC+arts night*, with wine and snacks contributed by Administrative Director Haruyama and others. There were many vivid conversations among the participants, irrespective of their positions, nationalities, and research fields, on, for instance, art, and music skills that are unexpected from their everyday life.



IPMUSIC+arts night in Piazza Fujiwara

Kavli IPMU Seminars

1. "Naturalness, Conformal Symmetry and Duality"
Speaker: Yoshiharu Kawamura (Shinshu U)
Date: Nov 06, 2013
2. "The SIMP Miracle"
Speaker: Jacob Wacker (SLAC)
Date: Apr 01, 2014
3. "A working Verlinde Formula for logarithmic CFT"
Speaker: Simon Wood (Australian National U)
Date: Apr 01, 2014
4. "The Search For New Physics in the LHC Age: Implications of the LHC and the Prospects for the Future"
Speaker: Jacob Wacker (SLAC)
Date: Apr 01, 2014
5. "Higher-order QCD effects in Higgs boson production"
Speaker: Bryan Webber (U Cambridge)
Date: Apr 02, 2014
6. "Interdisciplinarity and the interplay between mathematics and physics"
Speaker: Peter Goddard (IAS)
Date: Apr 02, 2014
7. "The Dark Side of Galaxy Evolution"
Speaker: Andrew Hearin (Fermilab)
Date: Apr 03, 2014
8. "Response theory of relativistic quantum Hall: A new topological current"
Speaker: Matthew Roberts (U Chicago)
Date: Apr 08, 2014
9. "Formulation of effective theories for dark matter direct detection"
Speaker: Natsumi Nagata (Kavli IPMU)
Date: Apr 09, 2014
10. "3D Mapping of the IGM on ~Mpc scales with Ly- α forest Tomography"
Speaker: Khee-Gan Lee (MPIA)
Date: Apr 10, 2014
11. Stability conditions for an N -Calabi-Yau algebra of the A_n -quiver"
Speaker: Akishi Ikeda (U Tokyo)
Date: Apr 14, 2014
12. "BICEP2 results, implications, and future"
Speaker: Chao-Lin Kuo (Stanford U/SLAC)
Date: Apr 14, 2014
13. "Cylinders in smooth del Pezzo surfaces"
Speaker: Jihun Park (Postech)
Date: Apr 15, 2014
14. "S-duality of nonsupersymmetric gauge theories"
Speaker: Anson Hook (IAS)
Date: Apr 15, 2014
15. "Decay of charged Higgs bosons into charm and bottom quarks in multi-Higgs doublet models"
Speaker: Andrew Gerard Akeroyd (U Southampton)
Date: Apr 16, 2014
16. "Can a Single Graviton be Observed?"
Speaker: Freeman Dyson (IAS)
Date: Apr 16, 2014
17. "Cylinders in singular del Pezzo surfaces"
Speaker: Ivan Cheltsov (U Edinburgh)
Date: Apr 17, 2014
18. "Q&A with Freeman Dyson"
Speaker: Freeman Dyson (IAS)
Date: Apr 17, 2014
19. "Seiberg-Witten invariants of smooth 4-manifolds"
Speaker: Tirasan Khandhawit (Kavli IPMU)
Date: Apr 17, 2014
20. "Recent advances in dS/CFT"
Speaker: Edgar Shaghoulian (Stanford U)
Date: Apr 22, 2014
21. "Cosmology with clusters, voids and their profiles"
Speaker: Ravi Sheth (ICTP)
Date: Apr 24, 2014
22. "Alpha-prime adventures"
Speaker: Ruben Minasian (CEA Saclay)
Date: Apr 24, 2014
23. "Some recent results on massive gravity"
Speaker: Cedric Deffayet (IAP)
Date: Apr 25, 2014
24. "Warped entanglement entropy"
Speaker: Edgar Shaghoulian (Stanford U.)
Date: Apr 28, 2014
25. "Multicomponent scenario of WIMP dark matter in the radiative seesaw models"
Speaker: Hiroshi Takano (Kavli IPMU)

- Date: Apr 30, 2014
26. "Complementarity of weak lensing, galaxy clustering and CMB data: constraints on neutrinos, dark energy and gravity"
Speaker: Roland de Putter (JPL)
Date: May 01, 2014
 27. "Precision of Standard Model parameters and Higgs properties"
Speaker: Bryan Webber (U Cambridge)
Date: May 07, 2014
 28. "Improved distance measurements with reconstructed WiggleZ"
Speaker: Eyal Kazin (Swinburne U of Technology)
Date: May 08, 2014
 29. "Homological mirror symmetry for the genus 2 curve"
Speaker: Daniel Pomerleano (Kavli IPMU)
Date: May 08, 2014
 30. "General instanton counting and 5d/6d SCFT"
Speaker: Seok Kim (Seoul National U)
Date: May 13, 2014
 31. "Relative BPS state counts for toric Del Pezzo surfaces and log mirror symmetry"
Speaker: Michel van Garrel (KIAS)
Date: May 14, 2014
 32. "Simulations of SNe Ib/c Shock Breakouts using multigroup radiation hydrodynamics"
Speaker: Alexey Tolstov (Kavli IPMU)
Date: May 15, 2014
 33. "Effective Temperature of Non-equilibrium Steady States in AdS/CFT"
Speaker: Shin Nakamura (Chuo U)
Date: May 20, 2014
 34. "Evolution of dust size distribution and extinction curves in galaxies"
Speaker: Takaya Nozawa (NAOJ)
Date: May 21, 2014
 35. "Known and unknown Zeldovich: simplest paths to complexity
- from flames to Large Scale Structure"
Speaker: Sergei Blinnikov (ITEP)
Date: May 22, 2014
 36. "On equivariant Pieri rule of isotropic Grassmannians"
Speaker: Changzheng Li (Kavli IPMU)
Date: May 22, 2014
 37. "Muon and neutral hadron detection in high energy physics"
Speaker: Eiichi Nakano (Osaka City U)
Date: May 28, 2014
 38. "Unusually Bright Supernovae"
Speaker: Robert Quimby (Kavli IPMU)
Date: May 29, 2014
 39. "Statistical properties of deterministic systems by elementary means"
Speaker: Boris Hasselblatt (Tufts U)
Date: Jun 03, 2014
 40. "Axion cosmology with high scale inflation"
Speaker: Kazunori Nakayama (U Tokyo)
Date: Jun 04, 2014
 41. "Counting curves in terms of modular forms"
Speaker: Jie Zhou (Harvard U)
Date: Jun 04, 2014
 42. "On some strange dynamical systems in the real plane"
Speaker: Sergei Duzhin (Steklov Inst of Mathematics)
Date: Jun 05, 2014
 43. "CMB B-mode polarization experiments: Recent results from POLARBEAR (and BICEP2)"
Speaker: Haruki Nishino (Kavli IPMU)
Date: Jun 05, 2014
 44. "Trees and an Affine Cover of $\bar{\mathcal{M}}_{0,n+1}$ "
Speaker: Charles Siegel (Kavli IPMU)
Date: Jun 05, 2014

45. "Flag Varieties and Quantum Cohomology, H. Schubert, A. Grothendieck and C. Dunkl"
Speaker: Anatol Kirillov (RIMS & Kavli IPMU)
Date: Jun 09, 2014

Personnel Changes

Reappointment

Exploiting a joint-appointment system that had been approved in the University of Tokyo in FY2012, Naoki



Naoki Yoshida

Yoshida, Professor at the Department of Physics, School of Science was reappointed as a Kavli IPMU Professor on April 1, 2014, with 40% of his time allocated for working at the Kavli IPMU. Previously, he was a Kavli IPMU Associate Professor from September 1, 2008 to March 31, 2012. Professor Yoshida speaks of his aspiration, "I am very excited about this new opportunity at Kavli IPMU. I've been working on numerical cosmology, especially on structure formation in the Universe. At Kavli IPMU, I'd like to make the best use of data from the Subaru HSC survey to study the nature of dark matter and distant supernovae."

Moving Out

Kavli IPMU postdoctoral fellow Atsushi Nishizawa has taken a position as a Lecturer at the Institute for Advanced Research of Nagoya University. He was at Kavli IPMU from September 1, 2010 to April 30, 2014.

Also, Kavli IPMU postdoctoral fellow Malte Schramm resigned the Kavli IPMU at the expiration of his term, from May 1, 2011 to April 30, 2014 and from May 16 to June 30, 2014.