

# Kavli IPMU 10th Anniversary Symposium

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On 16 – 18 October, 2017, the Kavli Institute for the Physics and Mathematics of the Universe (Kavli IPMU) celebrated its 10th anniversary with a ceremony and a scientific symposium.

The IPMU was established ten years ago, on 1 October, 2007, as a part of the World Premier International Research Center Initiative (WPI) of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan. In the spring of 2007, the Ministry solicited proposals to open “globally visible research centers that boast a very high standard and outstanding research environment, sufficiently attractive to prompt frontline researchers from around the world.” Our proposal for the IPMU was submitted in late May. After mail reviews and the initial selection process, a dozen of groups including ours were invited to oral presentations and interviews in late August. We were delighted when we learned in September that our proposal was selected as one of the five WPI centers. After the announcement, we had only a couple of weeks before launching the IPMU on 1 October. Unlike the other four institutes selected at the time, the IPMU was built from scratch, by bringing in Hitoshi Murayama from UC Berkeley as the Founding Director and by attracting Principal Investigators (PI’s) and faculty members from around the world. Four and half years later, in February 2012, the IPMU joined the Kavli family of research institutes and was renamed the Kavli IPMU in April.

As the 10th anniversary of the institute approached, Hitoshi wrote to me in January 2017, “I know you also chaired the Opening Symposium which was a smashing success. Unfortunately no



**KAVLI IPMU 10<sup>th</sup>**  
*Anniversary Symposium*  
*with Ceremonial Session*

**Oct 16 (Mon) - 18 (Wed), 2017**  
 Kashiwanoha Conference Center  
 Kavli IPMU

**Distinguished Speakers:**  
 John Ellis King's College London  
 Richard Ellis UCL  
 David Gross KITP  
 Takaaki Kajita ICRR / Kavli IPMU  
 Masayuki Nakahata ICRR / Kavli IPMU  
 Andrei Okounkov Columbia University  
 Kyoto University  
 David Spergel Princeton University  
 Shing-Tung Yau Harvard University

**IPMU Alumni Speakers:**  
 Robert Quimby San Diego State University  
 Susanne Reffert University of Bonn  
 Mauricio Romo Institute for Advanced Study  
 Christian Schnell Stony Brook University  
 Fuminobu Takahashi Tohoku University

**IPMU Researcher Speakers:**  
 Shigeaki Matsumoto  
 Kenzo Nakamura  
 Yoichiro Suzuki  
 Yuji Tachikawa  
 Masahiro Takada  
 Yukinobu Toda  
 Mark Vagins  
 Tsutomu Yanagida

FOR MORE INFORMATION <http://indico.ipmu.jp/indico/event/134/>  
 Kavli IPMU, 5-1-5 Kashiwanoha, Kashiwa, Chiba, 277-8583, Japan

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good deeds go unpunished.” This way, I became the chair of the organizing committee of the 10th anniversary symposium. The other committee members were: Mikhail Kapranov in mathematics, Mihoko Nojiri in particle phenomenology, Masahito Takada in cosmology and astrophysics, and Mark Vagins in experimental high energy physics.

We wanted the 10th anniversary symposium to be an occasion to showcase the institute’s achievements over the past ten years and to explore future directions of our research. With this in mind, we brought back some of our successful former students and postdoctoral fellows to learn their current research interests and to strengthen their networks. We invited leading scientists in our fields to survey



research frontiers and new opportunities. We also gave our current research scientists opportunities to present their research results by their plenary talks, three-minute “Gong Show” talks, and posters during the symposium.

The venue of the Symposium was a hotel near the Kashiwa-no-ha Campus Station. After opening remarks by Hitoshi Murayama, David Gross (2004 Nobel Laureate) and Shing-Tung Yau (1982 Fields Medalist) gave scientific talks. Both of them were at our opening symposium in 2008, and it was wonderful to have them back at our 10th anniversary and to show them the progress we have made with the institute. We asked them to give talks that represent their current research interests rather than overviews of their fields. David Gross responded by discussing his tour de force calculation of correlation functions of the Sachdev-Ye-Kitaev (SYK) model in the large  $N$  limit, which are deeply connected to the mystery of quantum black holes. Shing-Tung Yau discussed problems with mass and angular momentum in general relativity, in particular on their definitions for a space-like region bounded

by a closed surface, which was listed as one of the most important problems in general relativity by Roger Penrose in 1979. Yau presented a recent breakthrough he and his collaborators made in this problem.

These talks were followed by David Spergel, who is one of the PI's of the Kavli IPMU and is also the Founding Director of the Center for Computational Astrophysics at Simons Foundation's Flatiron Institute in New York. He discussed opportunities in observations of the cosmic microwave background. John Ellis, a leader in phenomenological high energy physics and a member of the External Advisory Committee of the Kavli IPMU, surveyed implications of the Higgs discovery at CERN and discussed directions of high energy physics research based on various possible outcomes of the LHC experiments at 13 TeV. Richard Ellis, a leader in observational cosmology, discussed the future of observation of the first galaxies and their roles in cosmic reionization. Andrei Okounkov (2006 Fields Medalist) works in an area of mathematics that is deeply connected to research interests of both mathematicians and

theoretical physicists at the Kavli IPMU. He gave a pedagogical introduction to issues one encounters in counting mathematical objects of physical interests and discussed how to overcome them. Takaaki Kajita (2015 Nobel Laureate) and Masayuki Nakahata, both of whom are PI's of the Kavli IPMU, discussed atmospheric neutrino experiments and supernova neutrinos, respectively.

The Kavli IPMU has been successful in attracting talented young researchers from all over the world and in mentoring them and providing them with an ideal research environment to become leaders in their fields. We are proud of the fact that many of our former postdoctoral fellows and graduate students are having successful careers with leadership positions at major research universities and institutes all over the world. To showcase their achievements, we have invited some of them to give talks at the symposium. Each of them was introduced by her/his mentor at the Kavli IPMU.

Susanne Reffert was one of our first postdoctoral fellows, who arrived at the Kavli IPMU in the fall of 2008. She is currently a full professor at the University of Bern, Switzerland. You can read her interview on her experience at the Kavli IPMU, in volume 16 of the *IPMU News*.<sup>\*</sup> At the symposium, she was introduced by Simeon Hellerman.

Christian Schnell is a mathematician and an associate professor at Stony Brook University, and he was introduced by Kyoji Saito. He works on the geometry and topology of complex algebraic varieties. Ken'ichi Nomoto introduced Robert Quimby, who is an associate professor at San Diego State University and the Director of the Mount Laguna Observatory. On the first day of this symposium, an announcement of the first observation of gravitational waves and subsequent electromagnetic signals from a pair of inspiralling neutron stars was made by the LIGO Scientific Collaboration, the Virgo Collaboration, and their partners. Given the excitement surrounding this discovery, I asked Quimby, who co-authored one of the papers that

analyzed the data, to give an extra talk to tell us about the discovery. Despite the short notice, he gave a beautiful presentation summarizing the observations and discussing their significance.

Fuminobu Takahashi, a phenomenological high energy theorist and a full professor at Tohoku University, was introduced by Tsutomu Yanagida, and Mauricio Romo, who is a postdoctoral fellow at the Institute for Advanced Study, was introduced by Kentaro Hori.

The research of our current staff scientists was presented by talks by Mark Vagins (supernova neutrinos), Yuji Tachikawa (quantum field theory), Shigeki Matsumoto (collaboration of particle physics and astrophysics), Masahiro Takada (Subaru Hyper Suprime-Cam) and Yukinobu Toda (Gopakumar-Vafa invariants), by the three-minute "Gong Show" talks, and by poster presentations.

The symposium ended with three historical talks on the genesis of the Kavli IPMU. I myself joined the planning of the IPMU in March of 2007, when I arrived at the University of Tokyo to spend a sabbatical quarter in the spring. For me, therefore, it was particularly interesting to listen to the talk by Yoichiro Suzuki, who discussed how a germinal idea of the institute was formed before my arrival in Tokyo in March.

After the proposal was submitted in May and even before it was selected in September, we started discussing a plan for our building, which has won awards for its design to stimulate collaboration. Tsutomu Yanagida, who led the planning of the building, discussed how the innovative concept of the building came about.

In addition to its scientific goals, another important mission of the Kavli IPMU was to "revolutionize conventional modes of research operation and administration in Japan" by introducing new practices such as flexible appointment schemes to attract best scientists from abroad. Kenzo Nakamura, who was the first administrative director of the Kavli IPMU, discussed the challenges we faced in implementing

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<sup>\*</sup> [http://www.ipmu.jp/sites/default/files/webfm/pdfs/news16/J\\_TalkingIPMU.pdf](http://www.ipmu.jp/sites/default/files/webfm/pdfs/news16/J_TalkingIPMU.pdf)





(Top row, left to right): Hiroshi Ooguri, Hitoshi Murayama, David Gross, Shing-Tung Yau, David Spergel, John Ellis. (Second row): Takaaki Kajita, Richard Ellis, Andrei Okounkov, Masayuki Nakahata, Susanne Reffert, Christian Schnell. (Third row): Robert Quimby, Fuminobu Takahashi, Mauricio Romo, Mark Vagins, Yuji Tachikawa, Shigeiki Matsumoto. (Fourth row): Masahiro Takada, Yukinobu Toda, Yoichiro Suzuki, Tsutomu Yanagida, Kenzo Nakamura, poster session.

new administrative initiatives and how we have overcome them.

On the first day of the symposium, we also had the 10th anniversary ceremony at the IPMU building with speeches by President Makoto Gonokami of the University of Tokyo, Director General Yasunao Seki of MEXT, WPI Program Director Akira Ukawa, and other dignitaries. Robert Conn, President and CEO of the Kavli Foundation also gave a speech, pointing out the portrait of Fred Kavli at Fujiwara Hall, where the ceremony was taking place, and discussing the successful partnership between the Kavli Foundation and the Kavli IPMU. The first contact between us was made in September 2007 at the 80th birthday symposium in honor of Fred Kavli, and it is wonderful to see how our partnership has grown in the past ten years.

The anniversary ceremony ended with a flash mob performance, starting with Yuuko Enomoto,

the director's assistant playing the koto (traditional Japanese strings), followed by Hitoshi Murayama playing the double bass, and by the Kavli IPMU orchestra and the University of Tokyo Orchestra Quartet, and finally everyone joined by singing the Ode to Joy from Beethoven's ninth symphony.

We have experienced a remarkable journey over the past ten years, building the institute from scratch, gathering together the best and brightest scientists, and having fun doing science at the same time. We have also made great successes in system reforms and outreach activities. I am grateful to everyone who believed in our dreams and supported our efforts. As the chair of the organizing committee, I would also like to thank staff members of the Kavli IPMU for their dedicated services. The institute is still young and full of hope for future, and we look forward to its next ten years.