Kavli IPMU-Berkeley Symposium "Statistics, Physics and Astronomy"

Toshitake Kohno

Kavli IPMU Principal Investigator

This symposium was held on January 11 and 12, 2018 Within the framework of the strategic partnership project UC Berkeley/UTokyo, and was a part of the program Berkeley Week at UTokyo. It was an interdisciplinary meeting focusing on various aspects of data science in mathematics, physics and astronomy. It is an important challenge at Kavli IPMU to interpret big data from astronomical observations using information statistics; therefore, the role of data science at Kavli IPMU will be increasingly important. The purpose of the symposium was to develop common interests in data science from the point of view of mathematics, physics, and astronomy.

The lecturers of the symposium were Wahid Bhimji (LBNL Berkeley), Shiro Ikeda (The Institute of Statistical Mathematics), Ippei Obayashi (AIMR, Tohoku University), Masanao Ozawa (Nagoya University), Alessandro Sonnenfeld (Kavli IPMU) and Philip B. Stark (Department of Statistics, University of California, Berkeley).

Shiro Ikeda explained recent developments in data science such as sparsity-based methods aiming for applications to EHT (Event Horizon Telescope). Masanao Ozawa described his quantum measurement theory and how it was related to showing the superiority of the interferometer type to the resonator type as a gravitational wave detector. Philip B. Stark talked about quantifying uncertainty in inferences in physics and astronomy. Alessandro Sonnenfeld described applications of Bayesian hierarchical inference methods in a broad range of astronomical studies. Ippei Obayashi gave an introduction to topological data analysis, specifically, persistent homology. He also showed us data analysis software of persistent homology called Homcloud developed by his research group. Finally, Wahid Bhimji explained developments of deep learning for high-energy physics and cosmology. The lectures of the symposium were held in the afternoon.

On January 10 and in the morning on January 11 and 12, there was an event, Berkeley Week@IPMU, organized by Yasunori Nomura. This event was also a part of the program, Berkeley Week at UTokyo. For Berkeley Week@IPMU we invited five postdoctoral researchers and two graduate students from the University of California, Berkeley. There were also talks by five young researchers of Kavli IPMU. The participants of Berkeley Week@IPMU also attended the symposium "Statistics, Physics and Astronomy." In this way we were able to share our common interests. The symposium and Berkeley Week@IPMU were extremely lively and there were many stimulating discussions.

Lectures on Higher Structures and Quantisation

Andrew Macpherson

Kavli IPMU Postdoctoral Fellow

From the 20th until the 22nd March 2018, students and researchers with interests at the interface between homotopy theory and geometry gathered at the Kavli IPMU for a series of lectures "on higher structures and quantisation" delivered by derived algebraic geometry veterans B. Toën and G. Vezzosi from Europe and "homotopical terrorist" (this term is due to A. Bondal) A. Mazel-Gee from the USA. The format, in which each was allowed two talks of 90 minutes, gave the speakers a chance to get in-depth about their chosen topics. Our international visitors were supported by local contributions from I. Iwanari of Tohoku university and Kavli IPMU's own M. Kapranov.

Rather than attempting to fix topics for the conference ahead of time, the interpretation of the deliberately broad title of the meeting was left to the speakers; that way, common themes could emerge naturally throughout the course of the week. Happily, this turned out to be the case—for instance, the theme of 'formal glueing' featured prominently in all of the lectures by our international guests.

When the participants arrived on the first day, we encountered a problem of the kind that every conference organiser hopes for: despite our initial worries about lack of publicity for this event, the lectures turned out to be oversubscribed to the point that there was not enough space in the room we had booked. Fortunately, the Kavli IPMU staff—especially Rie Kohama, who at all times was instrumental in ensuring that the meeting ran smoothly—were able to locate us a larger room in the campus library to accommodate the enlarged audience. Remarkably, the number of attendees remained stable on the second and third days, despite the vernal equinox which would have normally earned our local participants a day off.

The success of this conference is attested by the interactivity of the audience with the lecturers in each talk and by the positive feedback I received at the end. I even heard the lectures mentioned a number of times at each of the major conferences taking place on Tokyo University's Komaba campus in March, between which our conference was sandwiched. To the best of my knowledge, this meeting is the only one with this focus to have taken place recently in Japan. I hope that we will be able to repeat this experience and thereby create a new medium and international meeting spot for interaction between homotopy theory and geometry here at the Kavli IPMU.