School / Workshop "Noncommutative Deformations and Moduli Spaces"

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The school and workshop "Noncommutative deformations and moduli spaces" took place at Kavli IPMU the week of November 19 - 23, 2018. The thinking of the organizers was to gather scientists who work on the formal aspects of the theory of noncommutative deformations and algebraic geometers whose work encounters the necessity to go beyond the walls of the commutative world and consider the noncommutative moduli space of geometric objects and/or geometric moduli spaces of noncommutative objects.

Since the formal higher categorical theory is a quickly developing area of research, suggesting a very non-classical point of view on the deformation theory which is not very familiar to people from outside the Temple, it was decided to join the workshop with short lecture courses where experts can explain the main ideas of the formal theory in an accessible way without using technical language. This event format attracted many listeners from all over Japan and overseas who are interested in this trending theory of contemporary mathematics.

One course on derived deformation theory was given by Christopher Brav (Russia) and Nick Rozenblyum (USA). It was a nice introductory course on the most advanced homotopy approach to deformation theory. Many complicated formal topics, which include a number of categorical technicalities, were explained in simple language and illustrated with examples. The other course was run by Valerio Melani (Italy) and Pavel Safronov (USA). It was about basic notions and more advanced geometric applications of shifted symplectic and Poisson geometry. The presenters carefully explained how to pass from ordinary symplectic and Poisson geometry to the more advanced counterparts on derived algebraic stacks, which problems the classical approach encounters and how to overcome them.

The individual reports on the current research of the speakers can be roughly divided into two categories: formal aspects of the deformation theory and geometric applications.

Among the reports in the first category were talks by Isamu Iwanari (Tohoku) on operadic interpretation of deformation of DG categories inspired by Quantum Field Theory, by Agnieszka Bodzenta (Poland) on categorification of deformation theory via abelian envelopes of exact categories, by Andrew MacPherson (Kavli IPMU) on infinity-category interpretation of correspondences that also stems from 2-dimensional QFT, and by Michel Van den Bergh on triangulated categories that do not have DG enhancement.

The talks on various interrelated geometric applications included the one by Yukinobu Toda (Kavli IPMU) on applications of the derived geometry to Birational Geometry, by Mauro Porta (France) on applications to Analytic Geometry, by Yanki Lekili (UK) and Sheel Ganatra (USA) on applications to symplectic geometry, by Atsushi Takahashi (Osaka) and Hao Wen (China) on noncommutative Hodge theoretic aspects of the theory, by Marco Robalo (France) on motivic vanishing cycles, by Shinnosuke Okawa (Osaka) on noncommutative deformations of Del Pezzo surfaces, and by Ludmil Katzarkov (Russia, USA) on categorical curve complexes.

The workshop also included a student session, where advanced PhD students from Russia and the USA gave 30-minute reports on their research related to the subject of the workshop.