

Our Team

Andrei Mikhailov

Research Area: **Theoretical Physics**

IPMU Assistant Professor

String theory has a very beautiful and rich mathematical structure. And yet the common feeling is that the theory in its current formulation is unsatisfactory and perhaps even misleading. What are the fundamental degrees of freedom? Is the string perturbation theory the right approach to quantizing gravity? And if it is, what is the correct definition of the quantum theory living on the string worldsheet?

In the last several years new exciting results were obtained in the theory on the string worldsheet. One important achievement is the discovery of the pure spinor formalism by N.J. Berkovits. It gives an effective method of calculations of the string theory amplitudes at higher genus. Another important achievement is the use of integrability in AdS/CFT correspondence.



My work is directed towards the fusion of these new approaches. Most importantly, the application of the pure spinor formalism to the study of the AdS/CFT correspondence may be crucial for understanding the very foundations of string theory.

Our Team



IPMU Chamber Orchestra

John Silverman

Research Area: **Astronomy**

IPMU Assistant Professor



Ever since being swept into the field of astronomy back in the spring of 1995 at the Harvard-Smithsonian Center for Astrophysics, I have been heavily involved in the study of Active Galactic Nuclei (AGN), a population of galaxies undergoing substantial growth of their central black holes. This includes the completion of a thesis from the University of Virginia that addressed the evolution of AGN using ground-based optical telescopes to identify X-ray sources detected by the Chandra Observatory.

From there, my path has led to central Europe as a postdoctoral scientist to work with leading research groups at Max Planck Institute in Garching and ETH-Zurich to elucidate the broader role of supermassive black holes in the evolution of galaxies. As a member of the zCOSMOS survey, we have mapped

the three-dimensional distribution of galaxies with the Very Large Telescope and those that host AGN to determine the connection between black hole accretion and star formation, and the influence of environment.

Now as an IPMU researcher, I plan to use the Subaru telescope, loaded with new near-infrared capabilities, to answer questions regarding the growth of supermassive black holes in the early Universe. Furthermore, AGN science will be an active area at IPMU especially with respect to SDSS-III and wide-area surveys with HyperSuprimeCam.

Tathagata Basak

Research Field: **Mathematics**

Postdoc

My research lies in the crossroads of representation theory, geometry and number theory. Following early work of Allcock, I found evidences for a new connection between a complex hyperbolic orbifold and the largest sporadic simple group, the monster. One of my major project has been trying to understand this connection by studying this exceptional thirteen dimensional orbifold. This leads



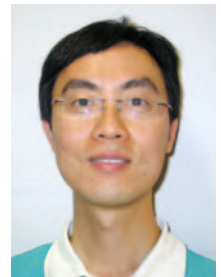
into the study of fundamental groups of hyperplane complements and uniformization of locally symmetric varieties.

Jing Liu

Research Area: **Experimental Physics**

Postdoc

I am an experimental physicist. I am hunting for new phenomena such as neutrinoless double beta decay, dark matter scattering with heavy nucleus, etc. The discovery of any of them would improve dramatically our understanding of the universe. They are extremely rare if ever happen. The studies are hence carried out in underground laboratories providing better shielding of cosmic rays. I am currently working on the XMASS experiment. It was designed as a general purpose detector aiming at



the direct search of dark matter, neutrinoless double beta decays and further study of solar neutrinos, etc. It is currently under construction in the Kamioka Underground Observatory. The construction is finishing very soon. Many exciting studies are ahead.

Masayuki Tanaka

Research Area: **Astronomy**

Postdoc

The Universe hosts a multitude of galaxies. Some have red colors, while others have blue colors. Some galaxies have beautiful spiral arms, while others do not. Properties such as colors and shapes are closely linked to where the galaxies are located. A galaxy cluster, in which many galaxies lie close to each other, is dominated by red galaxies without any clear arms. In contrast, isolated galaxies are typically blue with beautiful arms. Astronomers have yet to understand



why galaxies have their own favorite places in the Universe. I am observing the Universe using telescopes all over the world in a bid to find a clue to this long-standing question.

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