Our Team

Tadayuki Takahashi

Research Field: Experimental Physics

Kavli IPMU Professor*

I study various aspects of high-energy phenomena in the Universe, seen in X-rays and gamma rays. I have performed systematic studies of high-energy emission from black hole jets and supernova remnants, which are thought to be huge particle accelerators in the Universe, by using satellites and rockets. Observations in space require highly advanced detector technologies due to the severe conditions during the launch and in orbit, and also due to the very limited resources available. Through a series of satellite and rocket experiments, we have established cutting-edge technologies to make highly sensitive hard X-ray and gamma-ray detectors. Recently, it is becoming clear that these technologies also meet the long-standing demands from other fields such as (1) finding hot spots in gamma rays, (2) imaging of muon X-rays from muonic atoms, and (3) in-vivo 3D imaging of small animals to study cancer stem cells. New requirements from these applications are expected to further advance the performance of the detectors and enable us to design future hard X-ray and gamma-ray missions with much higher sensitivities than the present ones. I would like to organize interdisciplinary activities at the Kavli IPMU to develop advanced detectors to address urgent research topics, particularly in nuclear medicine.
In parallel with these experimental activities, I am continuing my research in high-energy astrophysics. One of the main topics will be the study of particle accelerators in the Universe. Understanding the connection between the process of magnetic reconnection and particle acceleration in a wide range of astronomical objects, from the Sun to black holes and clusters of galaxies will also be a subject.

*Kavli IPMU Principal Investigator from April 1, 2018.

Khee-Gan Lee

Research Field: Astronomy

Kavli IPMU Assistant Professor

Khee-Gan Lee, commonly known to his colleagues as "K.G.", is an observational cosmologist originally from Malaysia. His primary research interest is on studying the large-scale distribution of gas and galaxies in the distant Universe. Since this "cosmic web" reflects initial inhomogeneities that were laid down immediately after the Big Bang, his research helps constrain the fundamental physical parameters of the Universe. In particular, his speciality is in tomographic 3D mapping of hydrogen absorption during the "Cosmic Noon" period 10 billion years ago. He is an experienced observer with the Keck telescopes, and is helping plan future spectroscopic surveys using the Prime Focus Spectrograph on the Subaru Telescope. His shoe size is 26.5cm and his favorite color is blue.

Tadashi Orita

Research Field: Experimental Physics

Kavli IPMU Assistant Professor

I have been engaged in the field of radiation measurement, including in applications for environmental radiation monitoring, especially for Cs-137, and medical applications such as positron emission tomography and single photon emission CT. In those applications, I have focused especially on developing three-dimensional image reconstruction algorithms and electronics such as integrated circuits for high-speed and low-noise readout. By developing advanced measurement technologies that have realized heavy demands for physics experiments, I aim to further develop not only physics experiments, but also a three-dimensional imaging system which can achieve high sensitivity and high resolution for cancer stem cell research.

Atsushi Yagishita

Research Field: Experimental Physics, Medical Science

Kavli IPMU Assistant Professor

I have years of experience as a medical doctor and in clinical research. Inspired by this experience, I now work in chemical biology, where several fluorescent probes were synthesized. These fluorescent probes can detect stem cells (cells like "QUEEN BEE") including cancer stem cells in vitro. In Kavli IPMU, the probes will be converted into radioactive probes aiming for in-vivo imaging. Thus far, the microstructure of the internal body of living animals and humans cannot be visualized. However, our team will make it possible to visualize the microstructures of living animal tissues using the radioactive probes and a newly developed detecting device in which a hard X-ray/gamma-ray detector, which was developed for use in space observation, is incorporated.

Seyed Morteza Hosseini

Research Field: Theoretical Physics

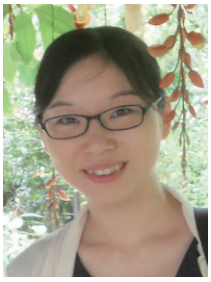
Postdoc

My research focuses on understanding the nonperturbative aspects of gauge and string theories. To this end, the most powerful tools are gauge/gravity duality and localization. The localization principle allows the path integral of a theory to be reduced into a matrix integral, and some exact results in strongly coupled field theories to be computed. It thus gives very precise predictions for the gauge/gravity duality. I utilize the combination of these ideas in order to understand the microscopic origin of the black hole entropy.

Yuko Ikkatai

Research Field: Science Communication, Psychology

Postdoc



I study various topics in science communication. My current main research theme is why the proportion of female students pursuing physics is low in Japan. It is known that the proportion of females majoring in physics is less than that in biology. This might be related to the social background of Japan; however, it has not been fully explored. I would like to explore the topic using qualitative and quantitative approaches. I am also interested in the new movements of "open science," which includes crowdfunding.