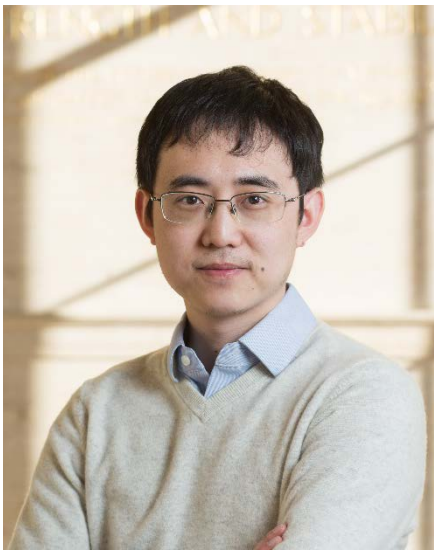

Massachusetts Institute of Technology

Name of the keynote speaker: Long Ju
Affiliation: Massachusetts Institute of Technology, USA

Short Biography (max. 300 words)

Dr. Long Ju received his B.S. in Physics in 2009 from Tsinghua University, China, and his Ph.D. in Physics in 2015 from the University of California, Berkeley. He then moved to Cornell University, where he was a Kavli postdoctoral fellow until December 2018. Dr. Ju joined the MIT Physics Department as an assistant professor in January 2019.

Research in Professor Long Ju's lab focuses on engineering and understanding novel quantum materials. Of particular interest are atomically thin materials and van der Waals hetero-structures of them. These materials host a variety of fascinating electronic and optical properties individually, and they offer exciting opportunities to explore possibilities enabled by controlling the stacking order and electrically tuning the band structure and charge doping. Especially, such materials provide a new platform to design and engineer more exotic quantum phenomena when electron correlations and topology are included. We develop problem-oriented experiments by employing various optical and electrical probes in a broad spectrum range from UV to DC. Ultrafast optical techniques and scanning probe optical microscopy will be utilized to study dynamical properties on a time scale down to femtoseconds and a spatial resolution of nanometers. Most importantly, device fabrication and application of electric and magnetic fields will be combined to achieve external control of material properties.

Title of the keynote talk: Novel Physics in Crystalline Multilayer Graphene

Abstract of the keynote talk (max 500 words)

The monolayer of graphite, known as graphene has been extensively studied in the past two decades. It exhibited a remarkable spectrum of physical, chemical, mechanical and other phenomena. While both

graphene and graphite are well-understood, the properties of intermediate layer thickness of the graphite crystal (crystalline multilayer graphene) are much less studied. Especially, the possibility of stacking graphene with other two-dimensional materials opened up a completely new route of material engineering and research. Through the interaction between layers, the resulted new materials could host phenomena that are absent from any of the individual layers. This demonstration of the emergent phenomena is at the frontier of physics and material sciences.

In this talk, I will report several exotic phenomena in van der Waals stacked heterostructures based on crystalline multilayer graphene, including a novel multiferroics, integer and fractional quantum anomalous Hall effects, widely tunable excitons by electric field, and so on. These phenomena features electron-electron interactions, and demonstrate the principles of electron correlations and topology. I will also discuss the implications of these observations on energy and quantum applications.