SEMINAR
Co-Hosted: Mechanical Engineering & Materials Science Science & Engineering

“Controlling light-matter interactions using two-dimensional materials and heterostructures”

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Monday, February 17
1:30 – 2:30 PM
Brauer Hall, Room 12

Abstract
The study of interactions between light and matter has played a central role in the development of quantum physics and underlies a range of technologies, including lasers and solar cells. Reliably controlling light-matter interactions promises to bolster new applications, such as quantum information processing, but remains challenging due to our limited ability to tailor the properties of optical materials.

In this talk, I will describe how recent materials innovations — in particular, the fabrication of two-dimensional semiconductors and their heterostructures — open up exciting new avenues for controlling light-matter interactions. First, I will discuss our efforts to improve the quality of atomically thin semiconductors and to understand their fundamental optical properties. I will then show how this fundamental understanding, along with careful engineering of their photonic environment, enables us to dramatically modulate the photoluminescence lifetime of emitters inside these 2D semiconductors. Finally, I will demonstrate how manipulating new degrees of freedom in creating 2D heterostructures, such as the twist angle between different layers, leads to new ways to engineer light-matter interactions at the nanoscale.

Biography
Dr. You Zhou is a postdoctoral fellow in Prof. Hongkun Park’s group at Harvard University. He earned his Ph.D. in Applied Physics from Harvard in 2015, studying under Prof. Shriram Ramanathan, after receiving his bachelor’s degree in Physics from Peking University in 2010. Dr. Zhou’s research focuses on understanding the behaviors of electrons, excitons, and ions in quantum materials, such as strongly correlated oxides and 2D materials, and controlling them for applications in information and energy technologies.

Faculty, students, and the general public are invited.