Chez Pierre

Presents ...

Tuesday, January 30, 2018
12:00pm
MIT Room 4-331

Special Chez Pierre Seminar

Luis Jauregui

Harvard University

"A story of light and matter in flatland"

Van der Waals heterostructures constructed of 2-dimensional (2-D) materials such as single layer transition metal dichalcogenides (TMDs) have sparked wide interest because of their large excitonic binding energy, allowing the exploration of novel quantum optical effects in a solid-state system and new opto-electronic devices. In this talk, I will discuss our results in manipulating excitons and trions (charged excitons) in monolayer TMD heterostructures. By exploiting the large excitonic binding energy, trions can be manipulated and confined electrostatically, enabling hybrid, electrically and optically active quantum dots. Secondly, I will discuss our recent results in van der Waals heterostructures formed by stacking together two different TMDs (forming a staggered heterojunction) encapsulated with hexagonal boron nitride with electrical contacts in each layer and a dual gate configuration. Excitons with electrons and holes residing in spatially separated quantum wells have long lifetimes (5-6 orders of magnitude longer than intralayer excitons) and diffuse across the entire sample (20 µm long) because of their repulsive Coulomb interaction, allowing for their manipulation and condensation. Interlayer excitons are important for novel opto-electronic devices such as high-temperature interlayer exciton condensates, near-infrared tunable lasers and light emitting diodes. Our work opens a new frontier to explore novel low-dimensional opto-electronic devices and circuits.