

UNIVERSITY OF CALIFORNIA, IRVINE

## THE DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

Is Proud to Host a Seminar by:

**ASSISTANT PROFESSOR LUIS A. JAUREGUI**

Dept. of Physics and Astronomy  
University of California, Irvine

**Thursday, February 16, 2023**

**2:00-3:20 PM**

**Location:**

**McDonnell Douglas Engineering Auditorium**

### **MANIPULATING THE ELECTRICAL AND OPTICAL OF QUANTUM MATERIALS AND HETEROSTRUCTURES**

**Abstract:** In this talk, I will delve into our research on manipulating quantum materials and heterostructures in a controllable fashion. Quantum materials, have gained widespread attention in the fields of condensed matter physics, materials science, and engineering. I will present our ongoing efforts to grow high-quality quantum materials and fabricate them into heterostructures that include air-sensitive components.

I will first discuss our findings on the impact of uniaxial strain on topological van der Waals quantum materials. Topological materials are a new type of quantum state of matter with boundary states that are immune to disorder. However, there have been limited examples of a topological phase transition realized experimentally, and even fewer cases of in-situ tuning. Our results show that the topological phase of these materials can be altered by uniaxial strain.

In the second part of my talk, I will discuss our approach to creating dynamic strain in van der Waals quantum materials and controlling the electron and excitons dynamics in these systems. Our research has the potential to pave the way for creating topological phases of matter through strain engineering in quantum materials and devices, and represents a step towards a solid-state quantum simulator platform.

**Bio:** Luis studied his Ph.D. at Purdue University and worked in the electron and phonon transport of graphene and topological nanostructures. For his graduate studies, he obtained the Intel Ph.D. Fellowship and the Purdue Research Foundation Fellowship. After his Ph.D., Luis became a Postdoctoral fellow at Harvard and his work was focused on studying the optical properties of van der Waals heterostructures. Since 2019, Luis is an assistant professor at the Physic Department at UCI and the director of the Irvine Quantum Material Center. In 2022, Luis received the prestigious NSF Career award. Luis' research work is interdisciplinary and ranges from Materials Science, Engineering and Physics. His work in quantum materials and devices includes high quality graphene growth, topological insulators, superconductivity, light-matter interaction in quantum materials, phonon polaritons, excitonic, etc.