



## Seminar/Talk

# Lattice and Superlattice Engineering of Quantum Materials

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Host: Latha Venkataraman

Manipulating materials at the atomic scale often drives advances in fundamental condensed matter physics. In this talk, I will introduce our newly established group's approach combining materials synthesis, advanced characterization, and device fabrication to achieve such control to ultimately create new quantum materials. First, I will highlight a new family of bulk van der Waals (vdW) superlattices derived from transition metal dichalcogenides, where reduced dimensionality and both in-plane and out-of-plane structural modulations give rise to novel electronic phases, for example, unconventional, spatially modulated superconductivity; I will connect these results from bulk compounds to contemporary work on other periodically modulated structures such as moiré materials. Then I will discuss the van der Waals metal  $\text{Pd}_5\text{AlI}_2$ , where a particular combination of atomic orbitals (i.e., chemistry) "decorating" a primitive square lattice gives rise to an electronic structure analogous to the 2D Lieb lattice model. I will conclude by looking forward and outlining our efforts to combine bulk materials and vdW heterostructure methods to unlock new ways of manipulating structure, symmetry, and chemistry, and novel quantum behavior therein.

**Thursday, May 15, 2025 11:00am - 12:00pm**

Office Building West/Ground Floor/Heinzel Seminar Room



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