



DEPARTMENT OF PHYSICS AND ASTRONOMY and
THE CENTER FOR SIMULATIONAL PHYSICS
2023 Chhabra-Landau Lecture



Discovering Nature with Computation: the Fascinating Quantum World of One- and Two-dimensional Materials

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Many phenomena in nature owe their emergence from the interactions of large number of particles. In condensed matter, many-body interaction and topological effects are often dominant in the quantum properties of reduced-dimensional systems. These effects lead to manifestation of counter-intuitive concepts and phenomena that may not be so prominent or have not been seen in the bulk. Their understanding and prediction are a challenging quantum many-body problem. In this talk, I present some fascinating quantum phenomena discovered in recent computational studies of atomically thin one- and two-dimensional materials. A number of interesting and unexpected behaviors have been found – e.g., strongly bound excitons (electron-hole pairs) with highly unusual energy level structures and optical selection rules; unique moiré excitons in bilayer heterostructures; tunable magnetism and plasmonic properties; novel topological phases; prominent correlated 3- and 4-particle excitations; enhanced nonlinear optical responses; remarkable field-driven time-dependent effects, etc. – adding to the promise of these materials for exploration of new science and valuable applications.



Thursday, April 13, at 3:55 PM

Physics Building Room 202

Via Zoom: <https://zoom.us/j/99879004873?pwd=Vkp2dHJDDU9tcnpNUWp5SFk4QVlVQT09>

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