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NCCR MARVEL Distinguished Lecture

The Fascinating Quantum World of Two-dimensional Materials: Interaction and Topological Effects

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Abstract: Interaction, symmetry and topological effects, as well as environmental screening, dominate many properties of reduced-dimensional systems and nanostructures. These effects often lead to manifestation of counter-intuitive concepts and phenomena that may not be so prominent or have not been seen in bulk materials. In this talk, I present some fascinating new physical phenomena found in recent theoretical and computational studies of atomically thin two-dimensional materials. A number of highly interesting and unexpected phenomena have been discovered – e.g., strongly bound excitons with unusual energy level structures and optical selection rules; light-like (massless) exciton dispersion; tunable optical, magnetic and plasmonic properties; electron supercollimation by 1D disorder; and novel topological phases. We describe their physical origin and compare theoretical predictions with experimental results when available.

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