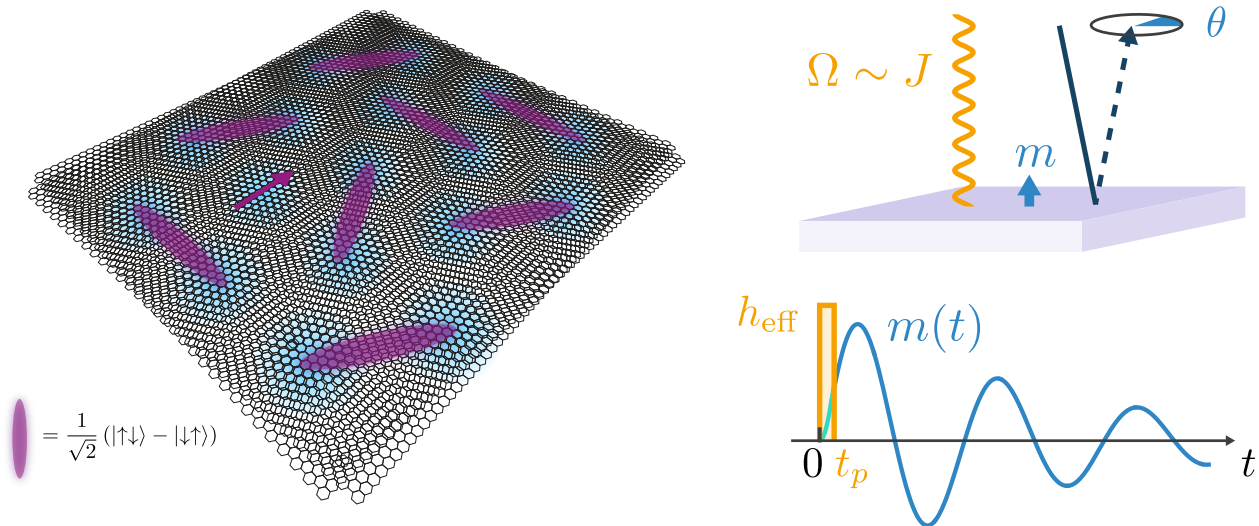




Novel magnetism and optical probing of magnetic dynamics in van der Waals heterostructures

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Recent years have seen remarkable progress in the exfoliation of van der Waals materials and their integration into heterostructures with an unprecedented degree of experimental control. In the first part of my talk, I will introduce Moiré heterostructures of transition metal dichalcogenides. In these systems, at fractional fillings, Mott-insulating states with concomitant charge crystallization have been discovered. I will discuss how these may serve as a platform for unconventional magnetic states, e.g. quantum spin liquids, and present a new itinerant mechanism for experimentally observed ferromagnetism upon weakly doping sufficiently dilute charge crystals.

In the second part of my talk, I will focus on optical pump-probe spectroscopy as a powerful tool for probing magnetic excitations. Motivated by recent pump-probe experiments on the (bulk) van der Waals antiferromagnet NiPS₃, I will present microscopic mechanisms for the excitation of coherent magnons using ultrafast optical pulses, which could also be used to probe anomalous relaxational behaviour, for example in putative Berezinskii-Kosterlitz-Thouless phases of monolayer van der Waals magnets.