

Physics Colloquium

Monday, September 16, 2019 / Pupin Hall Theory Center, 8th Floor / 12:30 PM

Lunch will be available for attendees

“Quantum sensing and imaging with diamond spins”

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The nitrogen vacancy (NV) center in diamond is an atomic-scale defect in diamond that is highly sensitive to a wide variety of fields: magnetic, electric, thermal, and strain. A versatile quantum sensor, the NV center holds particular promise for nanometer-scale imaging. Here I discuss an NV-based imaging platform where we have incorporated an NV center into a scanning probe microscope and used it to image a variety of condensed matter systems, including skyrmions, nanoscale topological spin textures, as well as current flow patterns in graphene. I also discuss recent experiments that utilize the NV center’s sensitivity to fluctuating magnetic fields to image conductivity with nanoscale spatial resolution. A grand challenge to improving the spatial resolution and magnetic sensitivity of the NV is mitigating surface-induced quantum decoherence, which I will discuss in the second part of this talk. Decoherence at interfaces is a universal problem that affects many quantum technologies, but the microscopic origins are as yet unclear. Our studies guide the ongoing development of quantum control and materials control, pushing towards the ultimate goal of NV-based single nuclear spin imaging.