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Nanoscale imaging of paramagnetic spin labels using a single spin in diamond. AMILA ARIYARATNE, BRYAN MYERS, MATTHEW PELLICCIONE, ANIA JAYICH, University of California Santa Babara — Spin-labeling molecules with paramagnetic species is a powerful technique for probing molecular structure. However, current techniques are ensemble measurements, inherently lacking the sensitivity to detect a single spin or the conformational properties of a single biomolecule. In this talk, we demonstrate an imaging technique that has the promise of single-spin imaging and ultimately molecular structure imaging. We present two-dimensional nanoscale imaging of a monolayer of gadolinium (Gd) atomic spin labels at ambient conditions. The sensing element is a single nitrogen-vacancy (NV) center in diamond. A patterned monolayer of Gd atoms self-assembled on a Si atomic force microscopy tip is controllably interacted with and detected by the NV center. The fluctuating magnetic field generated by GHz-scale Gd spin flips relaxes the NV center in a manner that depends strongly on the Gd-NV separation. Using this technique, we demonstrate a Gd-induced reduction of the T1 relaxation time of the NV center with nm spatial resolution. Our results indicate that nanometer-scale imaging of individual electronic spins at ambient conditions is within reach. This will ultimately enable the study of structural and functional studies of single biomolecules in their native, folded state.

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