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[8] Probing nanoscale magnetism using single spin magnetometry

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Electronic spins yield excellent sensors which enable quantitative, nanoscale imaging even down to the level of single spins. I will describe the basic working principles and technological achievements of such quantum sensors and highlight some of their recent scientific applications to open questions in condensed matter physics.

Specifically, I will discuss how we employ single electronic spins in diamond for nanoscale probing of antiferromagnetic systems and high-resolution imaging of atomically thin “van der Waals” magnets. For both, the combination of sensitivity, spatial resolution and quantitative imaging enables unprecedented insights such as quantitative, in-situ determination of magnetic moment densities or the imaging of nanoscale domains.

I will conclude with an outlook of future developments of single spin magnetometers for extreme conditions, such as high magnetic fields, millikelvin temperatures or for high-frequency sensors to probe the dynamics of nanomagnetic systems.

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