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Nanoscale thermometer based on color defects in diamond GEORG KUCSKO, PETER MAURER, MINAKO KUBO, NORMAN YAO, HONGKUN PARK, MIKHAIL LUKIN, Harvard University, LUKIN GROUP/PARK GROUP COLLABORATION — Measuring local temperature changes with confocal spatial resolution is of great interest to an array of scientific disciplines. Here we demonstrate a novel nanoscale temperature sensor with remarkable sensitivity by taking advantage of the quantum mechanical spin properties of nitrogen-vacancy color centers in diamond. This approach enables us to sense temperature variations with a sensitivity down to a few milli-kelvin and a spatial resolution of $\sim$ 200 nm. This remarkable sensitivity is achieved by using dynamical decoupling techniques in combination with the long spin coherence properties of our systems. We also demonstrate local temperature control on a sub-cellular level by laser heating of individual gold nanoparticles and measuring the local temperature using individual nanodiamonds induced into the cytoplasm of single biological cells. These results pave the way for a variety of potential applications ranging from physical to life sciences.

Georg Kucsko
Harvard University

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