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Technique detects various nuclei, structural features

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With an eye toward getting chemical and three-dimensional structural information from individual biomolecules or nanoscale features of a material, three research groups report advances in using diamond defects as NMR detectors under ambient conditions (*Nat. Nanotechnol.* 2014, DOI: [10.1038/nnano.2014.288](#) and 2015, DOI: [10.1038/nnano.2014.299](#) and [10.1038/nnano.2014.313](#)). The diamond defects are called NV centers and consist of a nitrogen atom and an adjacent lattice vacancy in

place of a pair of adjacent carbon atoms. The fluorescence from NV centers is sensitive to magnetic fields emanating from just outside the diamond. Researchers previously demonstrated that the centers could be used to detect NMR signals of polymer

hydrogens in sample volumes as small as 5 nm³. In the new work, teams led by [Daniel Rugar](#) of IBM, [Friedemann Reinhard](#) and Jörg Wrachtrup of Germany's University of Stuttgart, and [Ronald L. Walsworth](#) of Harvard University demonstrate that the centers can sense and distinguish between ¹H, ¹⁹F, and ³¹P signals. The researchers were also able to produce 2-D structural images with submicrometer resolution. All three teams scanned samples across individual NV centers. Walsworth's group also used an ensemble of centers and a charge-coupled device camera to image multiple nuclear species in a region measuring 50 μm².

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