Unlocking the potential of scanning near-field infrared microscopy

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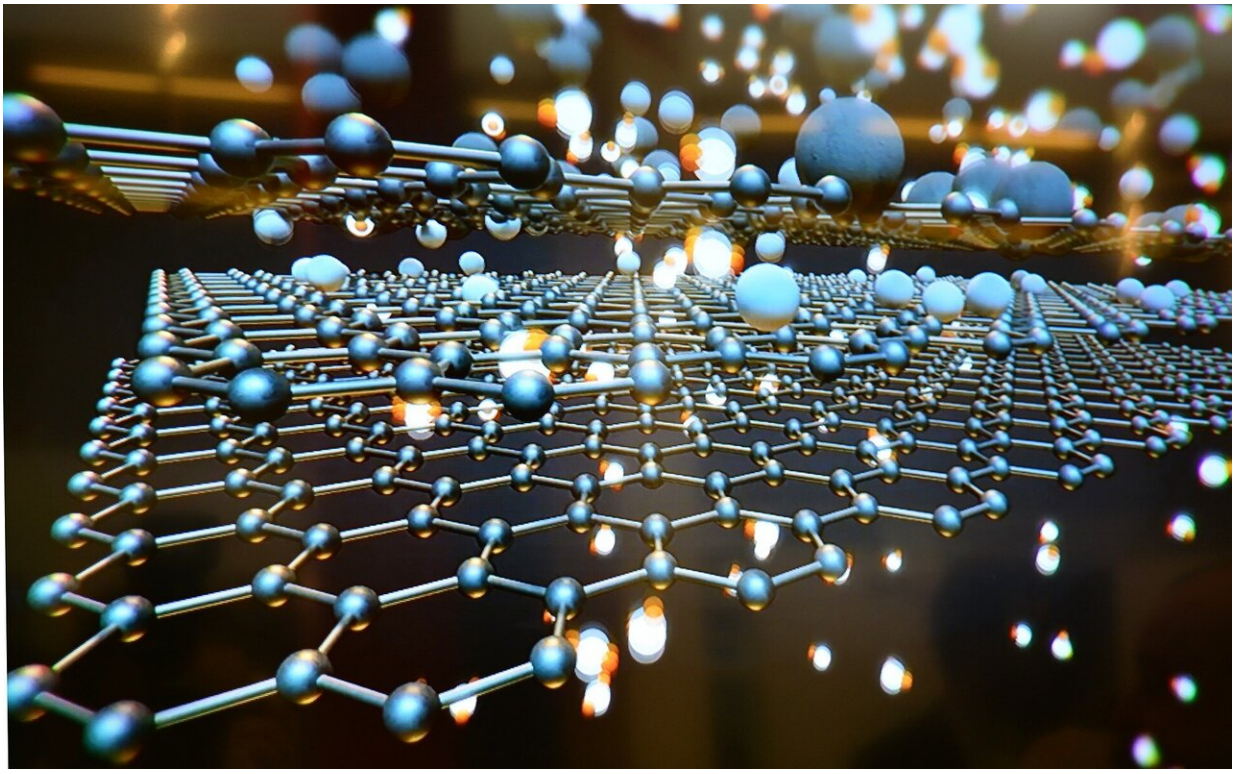

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In NPL's Quantum Materials and Sensors group, we study the nanoscale properties of emerging quantum materials, including graphene, photonic metamaterials, and topological insulators. Recently the pioneering nature of our research was recognized with an invitation to write a short article

for the journal *Nature Reviews Physics*. The Tools of the Trade article format is specifically targeted towards early-career researchers, so it was a great opportunity for me as I approach the end of my Ph.D.

I wrote about my recent work on combining scanning near-field optical microscopy, or SNOM, with other nanoscale electrical measurements. Unlike normal optical microscopy, SNOM can break the diffraction limit to measure the nanophotonic properties of materials. That means it can show us what happens when we confine light to much smaller scales than is normally possible, which can be exploited for advanced and novel technologies like super-resolution microscopy, on-chip optical computing, and even creation of entangled photons for quantum imaging. The novelty of our work in adding electrical measurements to SNOM, is that it allows direct measurements of the optoelectronic properties of miniaturized nanophotonic devices in situ.

Techniques like SNOM are in demand in both research and industry, particularly when combined with other nanoscale characterisation methods. Recognizing this, NPL's Quantum Metrology Institute has established the new Nanoprobe Cluster, a collection of advanced measurement techniques including SNOM, so that we can offer our services to support the developing quantum industry.

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More information: Tom Vincent, Scanning near-field infrared microscopy, *Nature Reviews Physics* (2021). DOI: 10.1038/s42254-021-00337-y

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