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Quantum imaging of living cells with bright squeezed light

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Microscopy is central to biological discovery, but high performance often requires high illumination powers that induce photodamage. Quantum correlations offer a way to overcome this limit by enhancing the signal-to-noise ratio at fixed optical intensities.

We present a quantum microscope based on stimulated Raman scattering (SRS), a widely used technique for molecular fingerprinting through vibrational frequencies. By illuminating living cells with bright squeezed light—a quantum resource compatible with the high intensities relevant to biological samples—we improve both probe quality and signal-to-noise compared to previous single-beam SRS implementations.

These advances enable fast, multispectral quantum imaging with noise levels below the shot-noise limit of state-of-the-art classical SRS microscopes. As an initial application, we demonstrate drug testing by monitoring the response of A549 cancer cells to Mycetin.

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