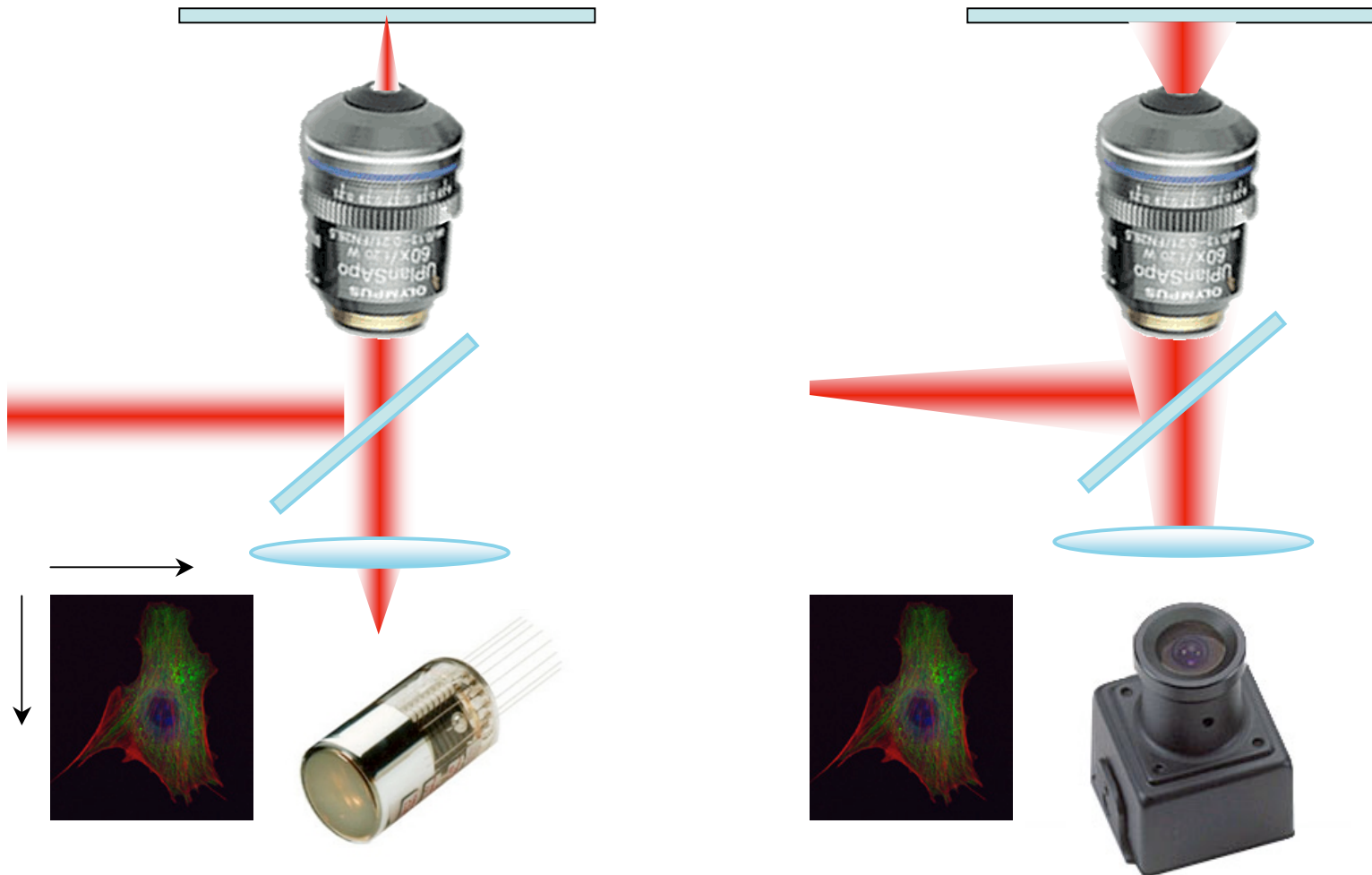
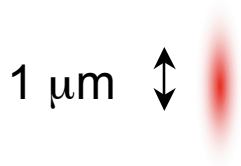


Wide-field vs. point-scanning

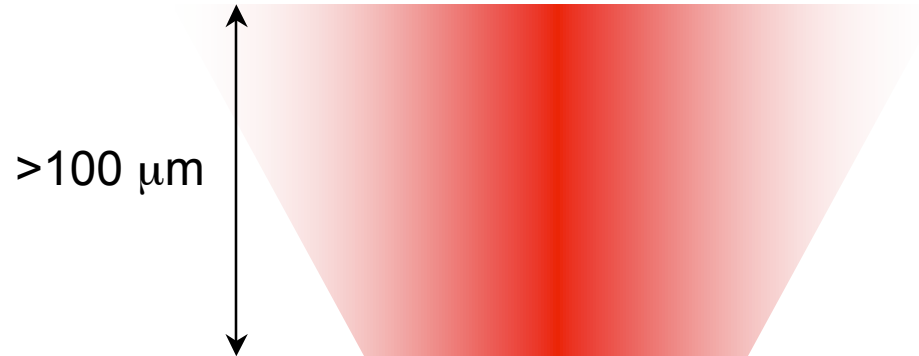


Phase matching and intensity



$$\Delta k \cdot L \approx 0$$

Very high excitation density



$$\Delta k \cdot L \gg 0$$

Very low excitation density

Wide-field CARS?

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Wide-field coherent anti-Stokes Raman scattering microscopy

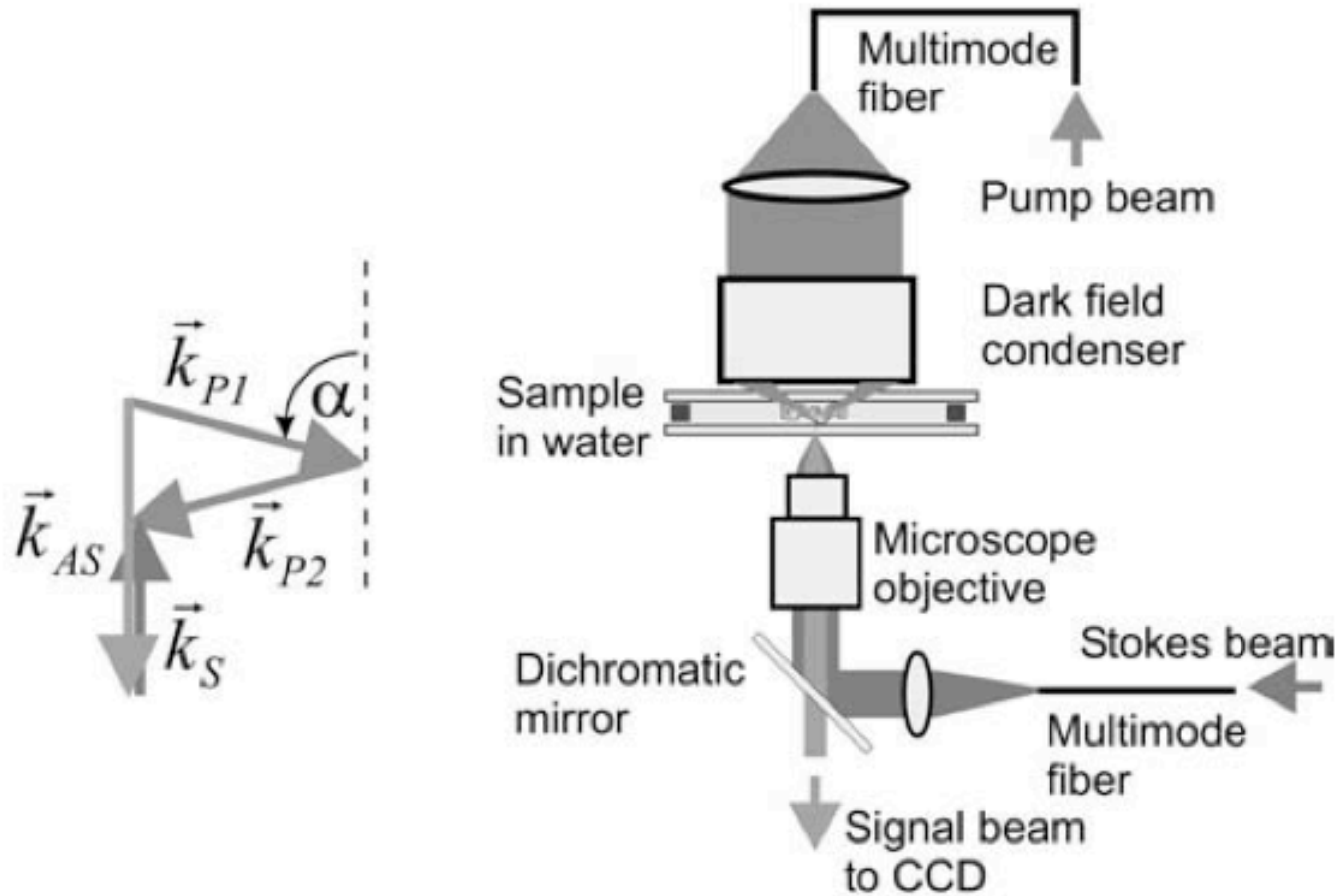
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We suggest a variant of coherent anti-Stokes Raman scattering (CARS) microscopy, which is a nonlinear microscopy method that has recently proven very successful in functional imaging of living cells with vibrational contrast. Whereas existing CARS microscopy techniques involve confocal scanning, in our setup excitation and detection are performed in a wide-field (nonconfocal) geometry, similar to a combination of dark-field and epifluorescence microscopy. The use of a nanosecond laser system rather than the typically used pico- or femtosecond systems furthermore implies a high spectroscopic resolution for various Raman-active substances. We demonstrate the feasibility of the wide-field approach on test samples and discuss its prospects to become a complementary method to confocal scanning CARS microscopy. © 2004 American Institute of Physics. [DOI: 10.1063/1.1641164]

Setup



Pump: 3 ns, 532 nm, 10 Hz

Stokes: 3 ns, 410-2600 nm, 10 Hz

Area: 100 μm , $\sim 10 \mu\text{m}$ interaction length

Power: 0.5 mJ at sample

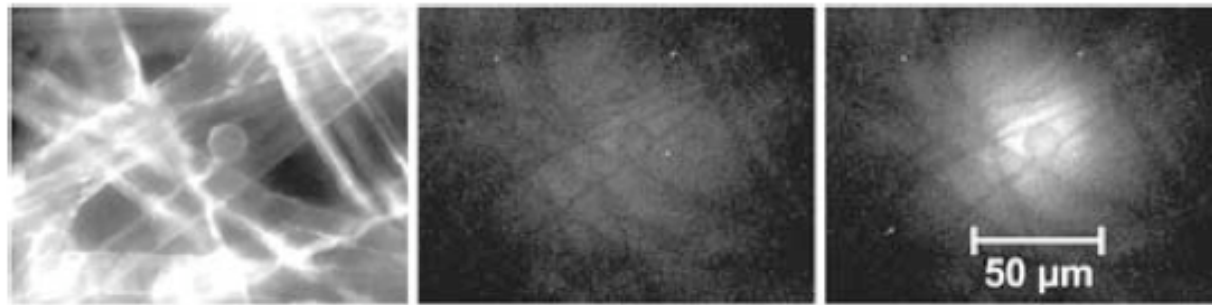


FIG. 2. Images of a test sample consisting of lens tissue fibers and $15\ \mu\text{m}$ microbeads immersed in methanol. Left: dark-field image with white light illumination. Middle: nonresonant CARS image. Right: resonant CARS image.

10 s per image (100 laser shots)