Title	**Phase-sensitive detection in Raman Tweezers: biological applications**
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Abstract	In the biomedicine field, scientists act as detectives working hard to unravel the mysteries surrounding cells. To this end, Raman spectroscopy has revealed itself particularly useful, providing information concerning both the chemical composition and the structural conformation of the investigated samples. If compared to many other techniques devoted to the identification of microorganisms (as for instance fluorescence spectroscopy), Raman spectroscopy presents the relevant advantage of providing sharp peaks correlated to vibrational modes of the investigated sample. Moreover, it is a noninvasive technique, not requiring the addition of chemical agents or labels for a sample identification. Therefore, Raman spectra behave as the fingerprints of the analyzed sample. Hence, the Raman spectroscopy technique represents a powerful tool to detect cellular transformations in real time, contributing to elucidate many biochemical processes even in living cells. However, the analytical capabilities of Raman spectroscopy are limited by its inability to manipulate, and therefore analyze the samples without making physical contact or disturbing their unique environment. This limitation has been resolved by coupling Raman spectroscopy to a technology called Optical Tweezers (OT). The new method, termed Raman Tweezers (RT), employs Optical Tweezers to trap a microsized object in order to confine its motion for Raman spectroscopic analysis. Optical Tweezers are based on the force exerted on micrometer-sized particles by a strongly focused laser beam. They allow trapping and manipulation of single particles without any mechanical contact.
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