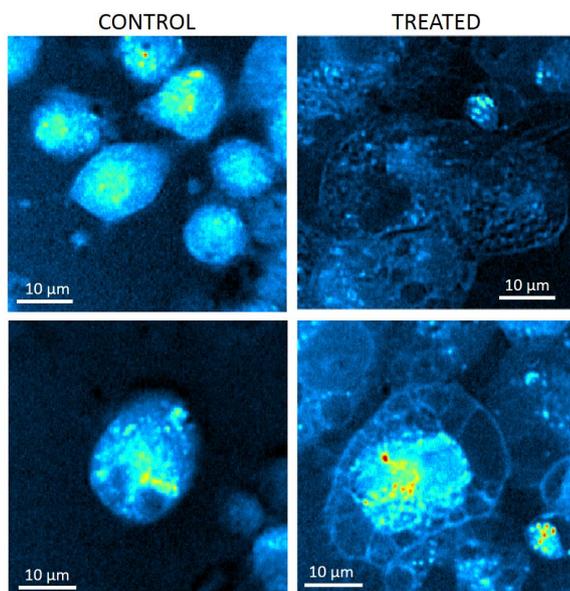




Broadband stimulated Raman scattering for non-linear label-free microscopy of cells and tissues

Prof. Dario Polli

Dipartimento di Fisica, Politecnico di Milano (Italy)
Institute for Photonics and Nanotechnologies – CNR Milano (Italy)



Fluorescence microscopy is a powerful investigation tool for life sciences. It can visualize morphological details in cells and tissues with sub-micrometer resolution and single-molecule sensitivity. However, fluorescent markers can perturb the investigated system and induce phototoxicity. This calls for intrinsic, label-free imaging methods such as Spontaneous Raman (SR) microscopy. SR measures the vibrational spectrum that characterizes every component of a biological specimen, reflecting its molecular structure and providing an endogenous and chemically specific “fingerprint”. Its main drawback is the very low scattering cross section, making it difficult to probe diluted species and preventing real-time imaging of dynamical processes in living cells or tissues. These limitations can be overcome by the use of coherent Raman scattering (CRS) techniques. CRS is a nonlinear

optical technique employing a sequence of ultrashort pulses to set up and detect a vibrational coherence within the molecules in the laser focus, which enhances the Raman response, thus allowing high imaging speeds with 3D sectioning capability. In this talk, I will review the state of the art and recent advances of CRS microscopy, in both coherent anti-Stokes Raman scattering (CARS) and stimulated Raman scattering (SRS) modalities. In particular, I will show a few examples of their application in biology, for studying cells and tissues and for tumor identification.

About the speaker: Dario Polli is Associate Professor of Physics at Politecnico di Milano (Italy). His main research focus is on coherent Raman spectroscopy and microscopy, ultrafast and non-linear optics, Fourier-transform spectroscopy and time-resolved pump-probe spectroscopy and microscopy. He is the coordinator of CRIMSON (www.crimson-project.eu), a pan-European H2020 project to develop the next-generation microscopy platform to study the cellular origin of diseases. He published >100 scientific papers on international journals, cited >5000 times. His H-index is 35. He has been awarded an ERC Consolidator grant (www.vibra.polimi.it) in 2015. He is passionate about science divulgation to the public. He is co-founder of NIREOS (www.nireos.com) and Specto Photonics (<http://spectophotonics.com/>) photonics startups. More info on <http://polli.faculty.polimi.it/> and www.linkedin.com/in/dariopolli/

