

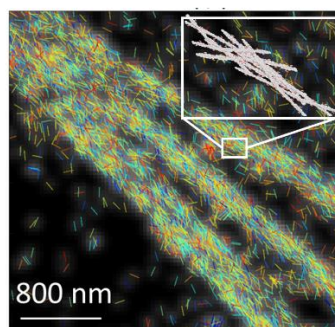
# Deciphering molecular organization at the nanoscale with advanced polarized microscopy

Sophie Brasselet<sup>a,\*</sup>

<sup>a</sup> Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, F-13013 Marseille, France

\* [sophie.brasselet@fresnel.fr](mailto:sophie.brasselet@fresnel.fr)

Optical microscopy imaging is very well established to explore and understand complex processes at the molecular-scale, with widespread applications in biology and nanophysics. The additional use of light polarization in optical microscopy has considerably progressed [1], until being able today to resolve orientations down to the single molecule level, together with their position at the nanoscale. I will show how the manipulation of light polarization in 3D, provided by non-paraxial conditions found in high resolution optical microscopy, can open new prospective in imaging, including fluorescence super resolution microscopy [2]. I will describe how such polarization-sensitive methods provide new information on molecular assemblies in biological samples [3], with interesting potential applications such as the real time tracking of proteins' conformational changes in cells.



**Figure 1** : Organization of actin filaments in stress fibers of a fixed cell measured by polarized super-resolved microscopy based on the localization of polarization-encoded fluorescent single molecules. The lines represent single molecules whose orientation is their average orientation and the color codes for the range of their angular fluctuations. In insert : a schematic representation of actin filaments.

- [1] S. Brasselet , “Polarization resolved nonlinear microscopy: application to structural molecular and biological imaging”, *Advances in Optics and Photonics* **3**, pp. 205–271 (2011)
- [2] V. Curcio, L. A. Aleman-Castaneda, T. G. Brown, S. Brasselet, M. A. Alonso, Birefringent Fourier filtering for single molecule Coordinate and Height super-resolution Imaging with Dithering and Orientation (CHIDO). *Nat. Communications* **11** (1) (2020)
- [3] C. Rimoli, C. Valades Cruz, V. Curcio, M. Mavrikis, S. Brasselet. 4polar-STORM polarized super-resolution imaging of actin filament organization in cells. *Nat. Communications* **13**, 301 (2022)