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A touch of cells at the nanometer scale: an optical and mechanical approach

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Imaging cellular internal structure at nanometer scale axial resolution with non invasive microscopy techniques has been a major technical challenge since the nineties. We have combined fluorescence microscopy, atomic force microscopy and high resolution surface plasmon microscopy to characterize the internal structures of an eukaryotic cell and probe its mechanical response. We describe the advantages of surface plasmon microscopy, as compared to fluorescence microscopy for providing both amplitude and phase imaging. Thanks to evanescent field enhancement by the surface plasmon resonance, the surface plasmon microscopy offers a very high resolution in Z scanning (Z being the axis normal to the sample). We show for fibroblast cells (IMR90) that SSPM is very well suited to discriminate regions of variable density in biological media such as cell compartments, nucleus, nucleoli and membranes. The one-to-one mapping of nuclear subdomains such as nucleolus, nuclear interchromatin domains, speckle domains by these two optical methods should allow us to interpret the density variations in between these domains, and to construct a nuclear phenotype of these cells depending of their culture medium, fixation and on the stiffness of the support on which there have grown.

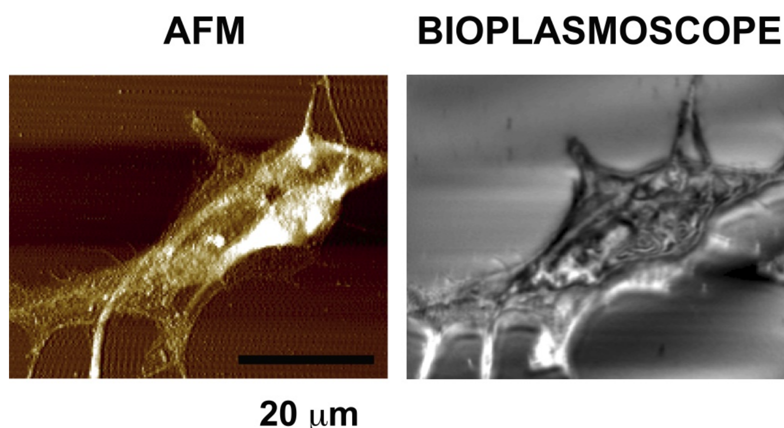

Fig. 1: *A comparison of an atomic force microscopy image with a surface plasmon resonance image*

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Références

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