# Subcellular Transfer of Nanoparticles and Targeting of Organelles

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Probing and perturbing the function of specific molecules inside cells is an essential prerequisite to widen our understanding of the subcellular organization. However, little means are hitherto capable of monitoring and manipulating biomolecules on nanometric scales. Nanoparticles in the form of quantum dots or magnetic nanoparticles constitute exquisitely sensitive tools to explore how molecules are dynamically orchestrated in cells. In recent years, these nanoprobes have led to fundamentally new insights about the viscoelastic nature of the cytoplasm, they enabled spatial localization of cytosolic molecules, as well as demonstrated the actuation of cell signaling processes [1,2]. Of particular challenge in undertaking these studies is the transfer of nanoprobes to the cytoplasm while maintaining their stealth property, monodispersity, and without compromising the cell integrity. Here, we present different mechanisms of subcellular nanoparticle transfer and summarize their (dis-)advantages. We characterize the nanoparticle mobility and stability after the transfer using FCS and single particle tracking, as well as present strategies to target nanoparticles to particular organelles [3]. Our results demonstrate how the subcellular environment influences particle behaviour and how these strategies may be used to probe cell mechanics, intracellular transport or membrane dynamics.

[1] C. Monzel et al. Chemical Science (2017)
[2] M. Debayle et al., Biomaterials, accepted
[3] D. Lisse et al., Advanced Materials, 29 (2017)