



INSIGHT SEMINAR: Metaoptics - based optomechanics

ROMAIN QUIDANT

December 15, 2025

16:00 to 17:00

Elements Room

ABSTRACT:

Recent advances in meta-optics have led to a further control over light-matter interaction, greatly contributing to different research directions including imaging, nonlinear optics, biosensing and photonic computing. While less explored, Meta-optics also offers great opportunities in the field of optomechanics, which studies systems whose optical and mechanical properties are intertwined, with applications to both fundamental physics and technologies.?

In this talk we discuss different approaches where silicon-based meta-optics contributes to advance optomechanical interactions. The first part of the talk discusses the use of hybrid metalenses interfaced with RF planar electrodes as a strategy to contribute to on-chip levitation optomechanics. We demonstrate their capability to stably trap individual and small

ensemble of nanoparticles and cool their mechanical motion down to low phonon occupation numbers. The second part of the talk discusses a different approach where meta-optics is used to precisely engineer optical forces to a level of control which goes beyond what is possible with standard silica particles. More specifically, we first show that optical forces are enhanced at their Mie resonances. Furthermore, we show both theoretically and experimentally that, in analogy with natural atoms, meta-atoms can be trapped in the dark, i.e. at a minimum of optical intensity.

BIO:

Romain Quidant received a PhD in Physics (2002) from the University of Dijon, France. He then joined the newly created ICFO in Barcelona as a postdoctoral researcher. In 2006, he was appointed junior Professor (tenure-track) and group leader of the Plasmon NanoOptics group at ICFO. In 2009, he became tenure Professor both at ICFO and ICREA. After nearly 18 years at ICFO, in June 2020, he joined the Mechanical and Process Engineering department (D-MAVT) at ETH Zurich. He is recipient of 3 ERC grants and several international and national prizes. Since January 2022, he serves as the Editor-in-chief of ACS Photonics (American Chemical Society). The research of the Quidant's lab focuses on nano-optics, at the interface between photonics and nanotechnology. It uses the unique optical properties of nanostructures as enabling tools to design solutions to scientific and technological challenges, in a wide set of disciplines, from fundamental physics to biotechnology. This makes its activities highly multidisciplinary, covering both basic and applied research. The most fundamental part is mainly directed towards enhanced light/matter interaction and optomechanics. From a more applied standpoint, his team investigates new strategies to control light and heat at the nanometer scale for biomedical applications, including lab-on-a-chip technology, and for reconfigurable planar optics.

Hosted by: Prof. Dr. Oriol Romero-Isart