ICFO



# 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 t advance optomechanical interactions. The first part of the talk discusses the use of hybri metalenses interfaced with RF planar electrodes as a strategy to contribute to on-chi levitation optomechanics. We demonstrate their capability to stably trap individual and smal

ensemble of nanoparticles and cool their mechanical motion down to low phono occupation numbers. The second part of the talk discusses a different approach wher meta-optics is used to precisely engineer optical forces to a level of control which goe beyond what is possible with standard silica particles. More specifically, we first show tha optical forces are enhanced at their Mie resonances. Furthermore, we show bot theoretically and experimentally that, in analogy with natural atoms, meta-atoms can b 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. e then joined the newly created ICFO in Barcelona as a postdoctoral research r. 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 nd ICREA. After nearly 18 years at ICFO, in June 2020, hejoined the Mechanical and Process ngineering department (D-MAVT) at ETH Zurich. He is recipient of 3 ERC grants and several nternational and national prizes. Since January 2022, he serves as the Editor-in-chief f ACS Photonics (American Ch
mical Society). The research of the Quidant's lab focuses on nano-optics, at the interface etween photonics and nanotechnology. It uses the unique optical properties of nano tructures as enabling tools to design solutions to scientific and technological chall nges, in a wide set of disciplines, from fundamental physics to biotechnology. This make its activities highly multidisciplinary, covering both basic and applied rese rch. The most fundamental part is mainly directed towards enhanced light/matter interac ion and optomechanics. From a more applied standpoint, his team investigates new strategi s to control light and heat at the nanometer scale for biomedical applications, including la -on-a-chip technology, and for reconfigurable planar optics.

**Hosted by:** Prof. Dr. Oriol Romero-Isart