*Engineering and Physical Sciences Research Council Doctoral Landscape Award*

**PROJECT TITLE:** Quantum Information with Mechanical Systems

**Lead Supervisor:** Dr Luca Dellantonio, L.Dellantonio@exeter.ac.uk

**Co-Supervisors:** Prof. Saverio Russo, s.russo@exeter.ac.uk

**Webpage:** https://experts.exeter.ac.uk/40577-luca-dellantonio

**Project details:** Achieving control of 127 qubits shed light on the progress in quantum computing, but also on the limitations in this field. To fill this gap, we will aim at extending the applications of mechanical platforms to information processing as an alternative to other platforms. Their ultra high-quality factors and the possibility of condensing more qubits into a single unit can be a step change in boosting the qubits' quality. For the first time, we will control the non-linear opto-mechanical coupling that allows manipulating the mechanical state beyond what is classically possible. This requires nanoscale resonators made from graphene, which due to their extremely low mass are sensitive to the minuscule momentum transferred by reflecting a photon.

This project will pave the way to quantum applications that – in addition to computing – include signal enhancement, noise reduction, mechanical signal processing, filtering, and transduction. We will devise a new generation of opto-mechanical devices that can attain the quantum non-linear optomechanical regime. The fabrication steps of suspended structures will follow similar steps as for suspended graphene and superconducting devices demonstrated at Exeter. In the case of membranes, we will enhance the mechanical quality factor and localize the mechanical mode by exploiting phononic crystals with defects. The PhD will be responsible for simulating the dynamics of these devices to optimize their fabrication.

**Project specific entry requirements:** MsC in physics

**Potential PhD programme of study:** PhD in Physics

**Department:** Physics and Astronomy

**Location:** streatham

**Please direct project specific enquiries to:** Dr Luca Dellantonio

Please ensure you read the entry requirements for the potential programme you are applying for.

To Apply for this project please click on the following link - **APPLY HERE**