

# Colloqui della Classe di Scienze

Anno Accademico 2025/2026

**Sala Stemmi**  
Palazzo della Carovana  
Scuola Normale Superiore  
Piazza dei Cavalieri, 7 - PISA

**29 OCTOBER 2025**  
h 3.00 p.m.

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*Quantum Sources of Gravity in the Lab*

**ABSTRACT:**

No experiment today provides evidence that gravity requires a quantum description. The growing ability to achieve quantum optical control over massive solid-state objects may change that situation -- by enabling experiments that directly probe the phenomenology of quantum states of gravitational source masses. This can lead to experimental outcomes that are inconsistent with the predictions of a purely classical field theory of gravity. Such "quantum Cavendish" experiments require to explore extreme regimes of both quantum and gravity phenomena, specifically: delocalized motional quantum states of sufficiently massive objects, as well as gravity experiments on the microscopic scale. Extending quantum optomechanics methods to trapped solids offers a unique approach for pushing into these ambitious parameter regimes. I review the current status in the lab and the challenges to be overcome for future experiments.

