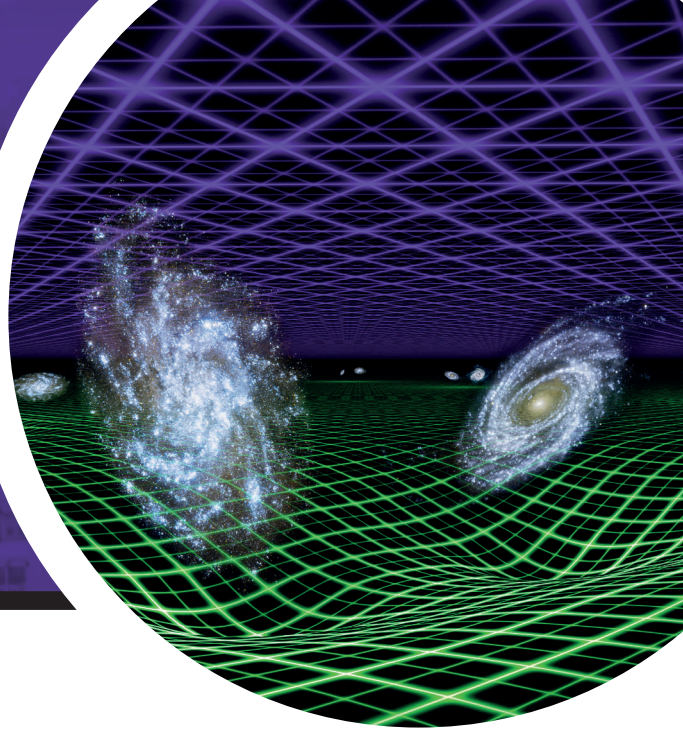
ICTP SAIFR | International Centre for Theoretical Physics South American Institute for Fundamental Research

INSTITUTO PRINCIPIA

WITNESSING QUANTUM ASPECTS OF GRAVITY IN A LAB



September 23 – 27, 2024

at Principia Institute, São Paulo, Brazil

INVITED SPEAKERS

Alessandro Codello (U. de la Republica, Uruguay)
André Landulfo (UFABC, Brazil)
Antonio D. Pereira (UFF, Brazil)
Barbara Amaral (USP São Paulo, Brazil)
Carlo Cepollaro (Austrian Acad. of Sciences & U. of Vienna, Austria)
Daine Danielson (U. of Chicago, USA)
Daniel Carney (LBL, USA)
Dave Moore (Yale U., USA)
Gautam Satishchandran (Princeton U., USA)
Gavin Morley (U. of Warwick, UK)
Giorgio Gratta (Stanford U., USA)
Hendrik Ulbricht (Southampton U., USA)
Iarley Lobo (Federal U. of Paraíba & Federal U. of Lavras, Brazil)
Jack Harris (Yale U., USA)
Jason Twamley (OIST, Japan)
John F. Donoghue (UMass Amherst, USA)
Jonathan Oppenheim (U. College London, UK)
Kristian Piscicchia (INFN-LNF & Centro Ricerche Enrico Fermi, Italy)
Luca Apadula (Austrian Acad. of Sciences & U. of Vienna, Austria)
Marko Toros (U. College London, UK)
Markus Arndt (U. of Vienna, Austria)
Markus Aspelmeyer (U. of Vienna, Austria)
Massimo Blasone (University of Salerno, Italy)
Maurício Richartz (UFABC, Brazil)
Nami Svaiter (CBPF, Brazil)
Oriol Romero-Isart (U. of Innsbruck, Austria)
Peter Barker (U. College London, UK)
Robert Mann (Perimeter I. and U. of Waterloo, Canada)
Roldão da Rocha (UFABC, Brazil)
Ron Folman (Ben Gurion U., Israel)
Sandro Donadi (Queens U., UK)
Timothy Light Kovachy (Northwestern U., USA)
Tong Cang Li (Purdue U., USA)
Vivishek Sudhir (MIT, USA)
Yanbei Chen (Caltech, USA)

ORGANIZERS

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Giorgio Torrieri (Campinas State U., Brazil)

Understanding gravity in the framework of quantum mechanics is one of the significant challenges in modern physics. Along this line, a primary question is whether gravity is a quantum entity subject to quantum mechanical rules. Despite the purported weakness of gravity, the phase evolution induced by the gravitational interaction of two-micron size test masses in adjacent matter-wave interferometers can detectably entangle them via the exchange of graviton mediation even when they are placed far enough apart to keep Casimir-Polder forces at bay.

This prescription for witnessing entanglement certifies gravity as a coherent quantum mediator through simple correlation measurements between two spins: one embedded in each test mass known as a QGEM (quantum gravity induced entanglement of masses) protocol. This workshop will discuss various theoretical and experimental challenges to conceive the QGEM protocol in a lab that will require an unprecedented level of accuracy in witnessing the quantum nature of one of nature's weakest interactions. Moreover, this workshop will also address other theoretical and experimental endeavors to conceive quantum-gravity phenomenology in several different settings.

This event will be instrumental in fostering exchange and collaboration among a diverse cluster of researchers, including expanding field landscapes and exploring new research directions. By incorporating perspectives from multiple communities, we expect to chart a path toward future trends for foundational physics from the study of quantum gravitational phenomena and their crossing with many different areas of modern physics. Key scientific topics at this intersection of theory and experiment cover the recent program for modeling tabletop tests to probe the quantum-gravitational origin of entanglement of massive objects, studies of analogue gravity in condensed-matter systems, tests of the equivalence principle, studies of the interplay of fundamental symmetries in neutrino oscillations, tests of modification of quantum mechanics in configurations where gravity plays an important role, modified dispersion relations, precision tests of general relativity in astrophysics, effective field theory of general relativity and the search of potential quantum gravity signatures in the investigation of cosmic messengers.

The first part of the workshop will focus on possible quantum experiments, and the second part will focus on theoretical aspects of general relativity.

There is no registration fee and limited funds are available for local expenses.

Registration deadline:
August 3, 2024

Online registration and more information:
ictp-saifr.org/wqag2024

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