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Colloquium of the Physics Department of ENS

Mercredi 28 Mai 2025, 13 :30
DPT-PHYS-ENS, salle ConfIV (Département de Physique de l'ENS - 24 rue Lhomond 75005 PARIS)
Domaines : physics

Titre : *Theoretical Challenges in Gravitational-Wave Astronomy*

Orateur : **Alessandra Buonanno (Max Planck Institute for Gravitational Physics (Albert Einstein Institute))**

Résumé : *Analytical and numerical solutions to the relativistic two-body problem have been crucial for detecting and interpreting a few hundred gravitational waves from compact-object binaries. Future experiments will probe the universe at the cosmic dawn, test our understanding of gravity, and reveal the composition of neutron stars with unprecedented precision.*

In this talk, I will review the key astrophysical, cosmological, and fundamental physics insights from current observations, highlighting the theoretical foundations that underpin them. I will then discuss the theoretical challenges that must be addressed (including improvements of up to two orders of magnitude in precision) to correctly interpret the vast number of gravitational-wave observations expected from next-generation detectors and to avoid drawing incorrect scientific conclusions. These challenges will arise with the Einstein Telescope and Cosmic Explorer on the ground, and the Laser Interferometer Space Antenna in space.