

Jeudi 5 Février 2026 à 11h (IAS)

Exploring the cosmic history of stars and galaxies with gravitational waves

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The population of compact objects (white dwarfs, neutron stars, and black holes) in the Universe is shaped by the cosmic evolution of stars and galaxies. Understanding this population allows us to probe the outcomes of stellar evolution, the history of star formation, and the hierarchical assembly of galaxies. Gravitational waves now provide a direct way to observe compact-object binaries and to measure their properties. With about 200 detections, the LIGO/Virgo/KAGRA interferometers have already profoundly changed our understanding of how stellar-mass black hole binaries form. Approved by ESA with a launch scheduled for 2035, the space-based interferometer LISA will observe gravitational waves at lower frequencies and will therefore access a different class of sources. Among its main targets are massive black hole binaries at the last stages of their evolution and compact binaries in the Milky Way with orbital periods ranging from a few minutes to a few hours. Massive black hole binaries are also currently being probed earlier in their evolution at even lower frequencies by pulsar timing arrays.

In this talk, I will discuss how gravitational-wave observations provide information that is complementary to electromagnetic observations and how, together, they can inform us about the cosmic history of stars and galaxies. I will focus in particular on observations of Galactic binaries with LISA and on multi-instrument studies of massive black hole binaries.