

Reverend George V. Coyne, S. J. Lecture in Astronomy & Astrophysics Seeing with New Eyes: Exploring the Universe with Gravitational Waves

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Gravitational waves are ripples in the fabric of space-time produced by catastrophic astrophysical events. They are the most elusive prediction of the theory of General Relativity, so feeble that Einstein himself thought their detection would be impossible. One hundred years later, the Laser Interferometer Gravitational-wave Observatory (LIGO) observed a pulse of gravitational waves that were produced 1.3 billion years ago by the collision of two black holes dozens of times more massive than our sun; the otherwise-invisible collision released in an instant gravitational waves with fifty times more power than all the light emitted in the visible universe.

LIGO consists of two 4-km interferometers, which use lasers and suspended mirrors to measure the tiny deformations of space-time induced by the passage of gravitational waves. Over the past five years, LIGO and its sister project Virgo have observed several more gravitational waves produced by the collisions of black holes and neutron stars; these discoveries that have effectively opened a new observational window on the Cosmos and seeded a new kind of multi-messenger astrophysics, where gravitational waves provide information that is complementary to that of electromagnetic or particle astrophysics. Together, gravitational waves, photons and neutrinos are now providing multi-sensorial perspective of the Universe. This lecture will cover the discovery of gravitational waves, summarize what we have learned so far from gravitational waves about black holes, neutron stars and the history of the Universe, and outline future prospects for the exploration of the Universe with gravitational waves.

Tuesday February 18, 2020, 7 PM, Weasler Auditorium