

# Advanced LIGO First Light: Multimessenger Astrophysics at the Birth of Gravitational-Wave Observatory

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## ABSTRACT

Advanced LIGO's direct observation of gravitational radiation from a binary black hole merger has sent quakes through the physics and astronomy community. In a few short years, the search for gravitational waves will complete its transformation from an experimental effort into a new discipline of observational astronomy as we rapidly build a sample of merging compact binaries. A particularly tantalizing goal is to combine our new GW observatories with existing electromagnetic ones—uncovering the host environments and formation channels of compact binaries, exposing the mechanism behind short GRBs, explaining the cosmic inventory of r-process elements, and even testing if stellar-mass black hole binaries are truly barren of matter and magnetic fields. I will describe results from LIGO's first observing run with a special focus on the electromagnetic follow-up program, which brings together real-time GW data analysis and 63 groups who are searching for counterparts of LIGO sources using ground- and space-based partner facilities spanning gamma ray, x-ray, optical, infrared, and radio wavelengths, as well as neutrinos. I will discuss the anticipated trajectory of the worldwide GW detector network from the standpoint of multimessenger observations, and I will conclude with some ideas for the future.