

Gravitational-Wave Transient Astronomy on the Rise

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The past three years have encompassed a meteoric rise of gravitational-wave astronomy with the activation of the first advanced gravitational-wave interferometers and the subsequent direct detection of GW150914 — a gravitational-wave transient from a merging binary black hole. Since then, two observing runs, spanning about a year of total observation time, have been completed and recently included the kilometer-scale French-Italian Virgo instrument. The payoff, a monumental joint electromagnetic and gravitational-wave campaign surrounding GW170817, added a crucial and highly anticipated component to multi-messenger astronomy. Primary among a rich set of results, this watershed event provided an unequivocal and long-anticipated link between short gamma-ray bursts, kilonovae, and binary neutron star mergers. I will report the key results driving the birth and growth of gravitational-wave astronomy: stellar mass black hole binaries and their implications for compact binary astrophysics, tests of general relativity, and the foundation for future studies. I will also enumerate the timeline and ongoing studies of GW170817/GRB170817A. Finally, I will review the progression towards a truly worldwide network of second generation gravitational-wave interferometers.

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