

The final ringdown of black holes and the first detection of gravitational waves

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ABSTRACT: A year ago the LIGO Scientific Collaboration announced the detection of GW150914, ushering us into era of gravitational wave astronomy. GW150914 was the violent coalescence of two black holes into a single, rotating black hole. The intense gravitational radiation emitted during the inspiral and merger of these black holes was detected directly by the Advanced LIGO interferometers here on Earth. In addition to its historic role as a first detection, GW150914 was remarkable in that the relaxation of the resulting black hole into a quiescent state was observed. This gravitational wave "ringdown" can provide a unique measurement of the mass and spin of the hole, and probes the consistency of our theories of black hole dynamics. After reviewing this landmark detection, I will describe the theory of black hole ringdown and its role in future tests of General Relativity. In addition, I will discuss the exotic predictions of the ringdown of rapidly rotating black holes, which may be tested by future ground- and space-based detectors. These include the slow relaxation of these black holes, transient instabilities near the horizon, and the possibility of turbulent gravitational dynamics.

ALL ARE WELCOME!