

**NEWS RELEASE**  
**February 11<sup>th</sup>, 2016**

**itsiiniigaxin Asessdu**  
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**GRAVITATIONAL WAVES DETECTED 100 YEARS AFTER EINSTEIN'S PREDICTION**  
LIGO Opens New Window on the Universe with Observation of Gravitational Waves from Colliding Black Holes

WASHINGTON, DC/Cascina, Italy

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*Washington, DC/Cascina Italy*

For the first time, scientists have observed ripples in the fabric of spacetime called gravitational waves, arriving at the earth from a cataclysmic event in the distant universe. This confirms a major prediction of Albert Einstein's 1915 general theory of relativity and opens an unprecedented new window onto the cosmos.

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Gravitational waves carry information about their dramatic origins and about the nature of gravity that cannot otherwise be obtained. Physicists have concluded that the detected gravitational waves were produced during the final fraction of a second of the merger of two black holes to produce a single, more massive spinning black hole. This collision of two black holes had been predicted but never observed.

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The gravitational waves were detected on September 14, 2015 at 5:51 a.m. Eastern Daylight Time (9:51 a.m. UTC) by both of the twin Laser Interferometer Gravitational-wave Observatory (LIGO) detectors, located in Livingston, Louisiana, and Hanford, Washington, USA. The LIGO Observatories are funded by the National Science Foundation (NSF), and were conceived, built, and are operated by Caltech and MIT. The discovery, accepted for publication in the journal Physical Review Letters, was made by the LIGO Scientific Collaboration (which includes the GEO600 Collaboration and the Australian Consortium for Interferometric Gravitational Astronomy) and the Virgo Collaboration using data from the two LIGO detectors.

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By looking at the time of arrival of the signals—the detector in Livingston recorded the event 7 milliseconds before the detector in Hanford—scientists can say that the source was located in the Southern Hemisphere.

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According to general relativity, a pair of black holes orbiting around each other lose energy through the emission of gravitational waves, causing them to gradually approach each other over billions of years, and then much more quickly in the final minutes. During the final fraction of a second, the two black holes collide into each other at nearly one-half the speed of light and form a single more massive black hole, converting a portion of the combined black holes' mass to energy, according to Einstein's formula  $E=mc^2$ . This energy is emitted as a final strong burst of gravitational waves. Based on the physics of this particular event, LIGO scientists estimate that the black holes for this event were about 29 and 36 times the mass of the sun, and the event took place 1.3 billion years ago. About 3 times the mass of the sun was converted into gravitational waves in a fraction of a second—with a peak power output about 50 times that of the whole visible Universe. It is these gravitational waves that LIGO has observed.

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