Gravitational waves:
a new message from the cosmos

One hundred years after **Albert Einstein** predicted the existence of gravitational waves, scientists detected the first - a burst of ripples in spacetime born of the catastrophic merger of two black holes. That discovery enabled the birth of a new field, multi-messenger astronomy, which combines signals from messengers throughout the cosmic universe.

1915
Albert Einstein lays out his general theory of relativity, revolutionizing the way we understand gravity and establishing the rules for spacetime.

1916-1918
Albert Einstein predicts the existence of gravitational waves, while adding that he doubts anyone will ever be able to detect their astonishingly small physical effects.

1957
At a conference in Chapel Hill, North Carolina, Felix Pirani, a young postdoc explains for the first time how scientists might one day detect gravitational waves.

1960's
The search for gravitational waves begins in earnest, and Joseph Weber builds the first "resonant bar detectors."

1971
Robert Forward builds the first interferometer for gravitational wave detection at Hughes Aircraft. It is a tabletop experiment.

1972
Rainer Weiss publishes the first serious analysis of the experimental challenges of gravitational wave detection with interferometers. This report is the genesis of the **Laser Interferometer Gravitational-Wave Observatory** (LIGO).

1999
Construction of **LIGO's** original gravitational wave detectors is completed.

2002
LIGO conducts its first search for gravitational waves.

2010-2014
LIGO goes offline for upgrades meant to increase its range 10 times farther out into the universe.

Sept, 2015
LIGO begins a much deeper search for gravitational waves.

Sept 14, 2015
LIGO detects gravitational waves for the first time, proving Einstein's General Theory of Relativity. These waves were caused by the collision of two black holes.

Dec 26, 2015
LIGO detects gravitational waves for a second time, once again caused by two black holes.

Jan 4, 2017
LIGO detects a third set of gravitational waves caused by two black holes.

Aug 1, 2017
Virgo, a gravitational wave detector located in Italy, goes online.

Aug 14, 2017
Virgo and **LIGO** detect gravitational waves, caused by two black holes.

Aug 17, 2017
LIGO detects gravitational waves caused by two neutron stars colliding, as do electromagnetic astronomers with traditional telescopes. This is the first-ever multi-messenger discovery.

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