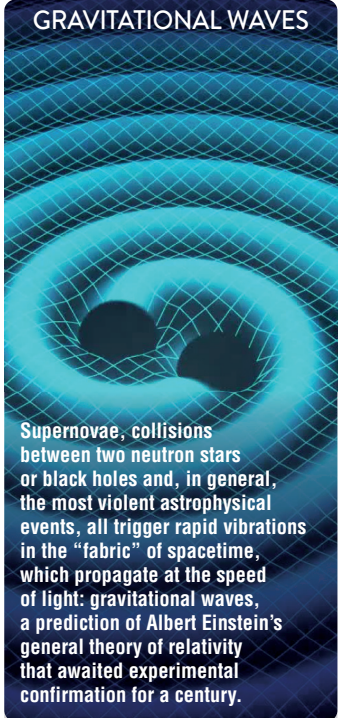


A global collaboration to observe gravitational waves



GRAVITATIONAL WAVES



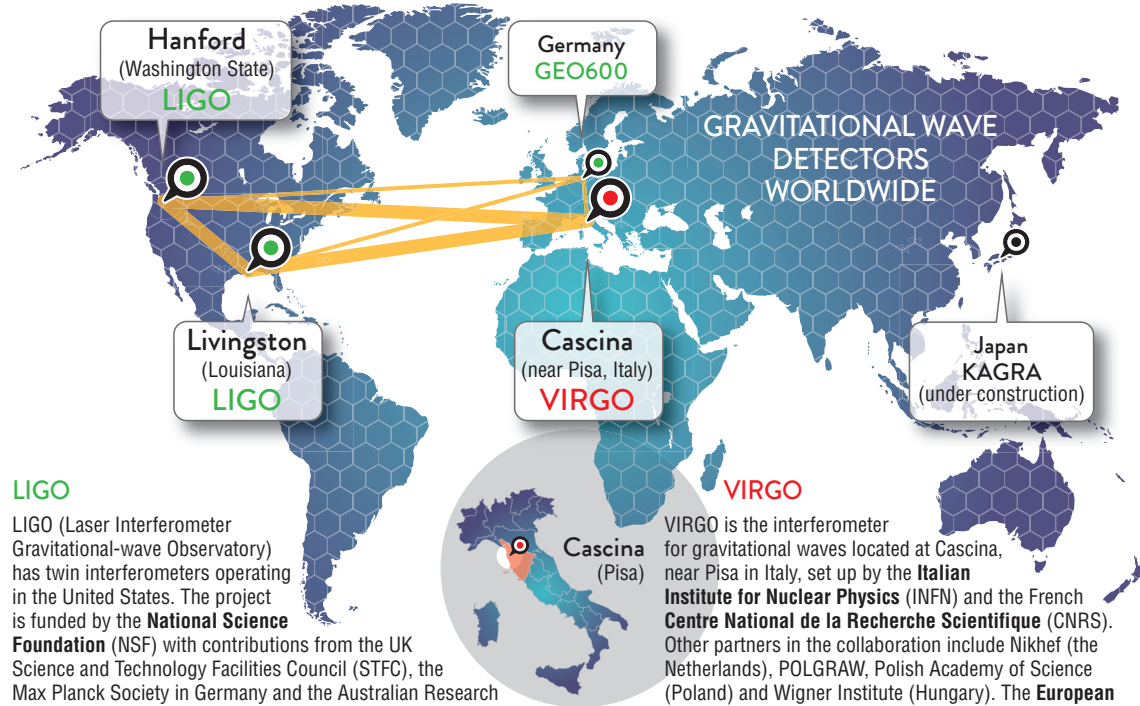
Supernovae, collisions between two neutron stars or black holes and, in general, the most violent astrophysical events, all trigger rapid vibrations in the “fabric” of spacetime, which propagate at the speed of light: gravitational waves, a prediction of Albert Einstein’s general theory of relativity that awaited experimental confirmation for a century.

HOW WE DETECT THEM: LASER INTERFEROMETERS

Gravitation is the weakest interaction in the universe: detecting gravitational waves is therefore an extremely complex task. To do it, physicists have developed and built special detectors: **giant laser interferometers**.

COLLABORATION BETWEEN EXPERIMENTS

Several interferometers operating jointly are required to reconstruct the direction from where a gravitational wave has come and thus identify its source. That is why **a network of laser interferometers has been set up to operate as a single experiment** worldwide. Since almost a decade the LIGO and VIRGO collaborations have agreed to share and exchange technology, coordinate data taking periods, analyse the data together and publish common physics results.



LIGO

LIGO (Laser Interferometer Gravitational-wave Observatory) has twin interferometers operating in the United States. The project is funded by the **National Science Foundation** (NSF) with contributions from the UK Science and Technology Facilities Council (STFC), the Max Planck Society in Germany and the Australian Research Council (ARC). It is operated by scientists at Caltech and MIT. The **LIGO** scientific collaboration also includes the **GEO600** detector in Germany. **More than 1,000 scientists** from institutions in the US and of 14 other countries are involved in the project.

Advanced LIGO

Work on the Advanced LIGO upgrade, which started before the VIRGO upgrade, was completed in spring 2015. The first series of data taking runs began in September that year.

VIRGO

VIRGO is the interferometer for gravitational waves located at Cascina, near Pisa in Italy, set up by the **Italian Institute for Nuclear Physics (INFN)** and the **French Centre National de la Recherche Scientifique (CNRS)**. Other partners in the collaboration include Nikhef (the Netherlands), POLGRAW, Polish Academy of Science (Poland) and Wigner Institute (Hungary). The **European Gravitational Observatory (EGO)** is responsible for operating the VIRGO gravitational wave detector. VIRGO is a scientific collaboration involving some **250 physicists, engineers and technicians from 19 European laboratories**.

Advanced VIRGO

The construction is almost complete and the interferometer will start running in the second half of 2016.