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The CNRS congratulates Rainer Weiss, Barry C. Barish and Kip S. Thorne, winners of the 2017 Nobel Prize in Physics

The 2017 Nobel Prize in Physics has been awarded to the physicists Rainer Weiss, Barry C. Barish and Kip S. Thorne for the detection of gravitational waves, predicted by Albert Einstein in 1916 in his general theory of relativity. The discovery [was announced on 11 February 2016 by the LIGO-Virgo collaboration](#) of which the CNRS is the only French member. It is the result of both theoretical and experimental work by a host of scientists over several decades. The award is therefore an encouragement to the entire gravitational wave community, in which Rainer Weiss, Barry C. Barish and Kip S. Thorne were pioneers, as were the French researchers Alain Brillet and Thibault Damour, who recently received the [CNRS Gold Medal](#). The CNRS pays tribute to the recognition by the Nobel Prize jury of this major breakthrough.

Predicted by Einstein a century ago, gravitational waves long represented a 'holy grail' for physicists. In 1974, Russel Hulse and Joseph Taylor discovered a binary system made up of a pulsar in orbit around a neutron star (PSR 1913+16), which earned them the 1993 Nobel Prize in Physics. Studying this system provided the first indirect evidence of the existence of gravitational waves.

It was only several decades later, on 14 September 2015, that the first signal from a gravitational wave was detected by the two LIGO¹ interferometers. This very first detection was announced on 11 February 2016 by the LIGO and Virgo collaborations, which have been working hand-in-hand since 2007. More than 70 researchers and engineers from CNRS laboratories were among the thousand or so authors of the publication. There have been three further detections since then, the latest of which, on 14 August 2017, was made by the LIGO and Virgo² detectors. This first detection by a network of three instruments, which in particular significantly improved localization of the source in the sky, illustrates the astronomical potential of gravitational waves.

The LIGO and Virgo projects began separately in the 1980s. Virgo was initially set up thanks to the visionary ideas of France's Alain Brillet and Italy's Adalberto Giazotto. Construction of the Virgo interferometer, at Cascina, Italy, began in 1996. It was funded and carried out by the CNRS and INFN (the Italian National Institute for Nuclear Physics), which took on a long-term commitment to this major research facility. Over the years, contacts and exchanges between the LIGO and Virgo collaborations became increasingly close, until in 2007 they began to jointly exploit their data. It was also in 2007 that the Netherlands joined the Virgo collaboration in order to take part in building the Virgo detector, and then

¹ LIGO (Laser Interferometer Gravitational-wave Observatory) is a detector made up of two interferometers located in the US, at Livingston, Louisiana and Hanford, Washington State.

² Virgo is an interferometer located at Cascina, near Pisa (Italy).



Advanced Virgo³, followed by three more countries—Poland, Hungary and, more recently, Spain—whose teams⁴ participate in the scientific exploitation of the LIGO-Virgo data.

The first detections of gravitational waves, celebrated by the 2017 Nobel Prize in Physics, were made possible by ambitious multiannual upgrading programs, from 2010 to 2015 for LIGO and from late 2011 to 2017 for Virgo.

In parallel with the development of the instruments, a long-term endeavor—to which France made a decisive contribution thanks in particular to Thibault Damour's work—provided the theoretical models that made it possible to predict, analyze and interpret the signals observed, first from the PSR1913+16 binary system and eventually from the latest direct detections of gravitational waves.

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³ An upgraded version of the first-generation Virgo detector.

⁴ The organizations and research groups involved are Nikhef (Netherlands), MTA Wigner RCP (Hungary), the POLGRAW group (Poland) and the University of Valencia (Spain).