Vassiliki Kalogera

About her scientific career

Vassiliki Kalogera

She was born in 1975 in Serres, Greece and received her undergraduate degree in physics in 1992 from the Aristotle University of Thessaloniki.

She attended the University of Illinois at Urbana–Champaign, where she completed her Ph.D. in astronomy in 1997. She also joined the Harvard-Smithsonian Center for Astrophysics as a CfA postdoctoral fellow (1997-2000) and was awarded the Clay Fellowship in 2000-2001.

Kalogera was appointed Assistant Professor at Northwestern University in the Department of Physics and Astronomy in 2001 and was promoted to Associate Professor in 2006, to Erastus Otis Haven Professor of Physics and Astronomy in 2009 and to Daniel I. Linzer Distinguished Professor and Professor of Physics and Astronomy in the Weinberg College of Arts and Sciences at Northwestern, in 2017.

She was the Co-Director of the Center for Interdisciplinary Exploration and Research in Astrophysics (CIERA), Northwestern University in 2009 and became the Director of the CIERA in 2012.

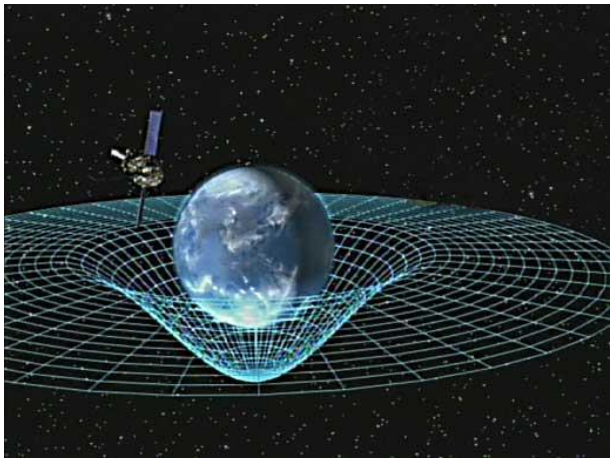
Aerial photo of LIGO Livingston, Louisiana.

(Caltech/MIT/LIGO Lab)

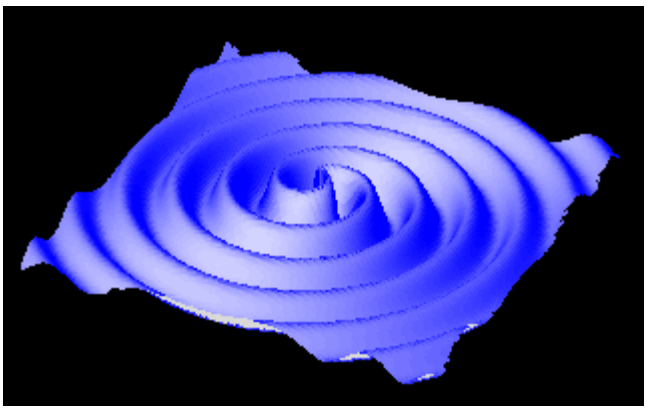
Kalogera is among the lead astrophysicists in the Laser Interferometer Gravitational-Wave Observatory (LIGO) Scientific Collaboration (LSC). LIGO is the world's largest gravitational wave observatory and a cutting edge physics experiment. The discovery of gravitational waves is expected to open a new field in astronomy. Also they will contribute to a better understanding of the birth of Cosmos, since the gravitational waves existed long before the "electromagnetic radiation" was born in the Universe.

The first observation of gravitational waves was made on 14 September 2015 and was announced by the LIGO and Virgo collaborations on 11 February 2016 (Nobel Prize in Physics in 2017). The signal was named GW150914 (from "Gravitational Wave" and the date of observation 2015-09-14). The gravitational waves originated from a pair of merging black holes. On 17 August 2017, another gravitational wave signal was observed by the LIGO and Virgo detectors called GW170817. The GW was produced by two neutron stars spiralling closer to each other and finally merging.

Gravitational waves are 'ripples' in the fabric of space-time caused by some of the most violent and energetic processes in the Universe. Albert Einstein predicted the existence of gravitational waves in 1916 in his general theory of relativity. Einstein's mathematics showed that massive accelerating objects (such as neutron stars or black holes orbiting each other) would disrupt space-time in such a way that 'waves' of distorted space would radiate from the source (like the movement of waves away from a stone thrown into a pond). Furthermore, these ripples would travel at the speed of light through the Universe, carrying with them information about their cataclysmic origins, as well as invaluable clues to the nature of gravity itself. The strongest gravitational waves are produced by catastrophic events such as colliding black holes, the collapse of



Two-dimensional illustration of how mass in the Universe distorts space-time (Credit: NASA).



Two-dimensional representation of gravitational waves.

stellar cores (supernovae), and of course during the birth of the Universe itself.

As an expert in the astrophysics of black holes and neutron stars and in LIGO data analysis, Kalogera has been a member of the LSC for more than 15 years. Kalogera's astrophysics research involves methods from applied mathematics, statistics and computer science, with extensive use of high-performance computing.

In parallel to her gravitational-wave source studies, Kalogera also studies the formation and evolution of stars and their remnants detectable as gamma-ray, X-ray, and radio pulsar sources in the electromagnetic spectrum in a wide range of stellar environments.

Awards and honors

- *Annie J. Cannon Award* in Astronomy (is awarded annually by the American Astronomical Society).

In 2002, Kalogera won the American Astronomical Society's Annie Jump Cannon Award, which recognizes outstanding research for a postdoctoral woman researcher.

- *Packard Fellowships for Science and Engineering*, by the David and Lucile Packard Foundation, in 2002.
- *Cottrell Scholar Awards 2004*, Northwestern University.

- *Maria Goeppert Mayer Award* (is awarded by the American Physical Society's).

In 2008, she received the Maria Goeppert-Mayer Award for her study of evolution and fate of compact binary objects.

- Hans A. Bethe Prize.

In 2016 she was awarded the *Hans Bethe Prize* of the American Physical Society (APS) for her contributions to the study of the electromagnetic and gravitational wave radiation from binary compact objects.

A sketch of Kalogera drawn by the pupil Ioanna Faskioti.

- *Heineman Prize* for Astrophysics of the American Institute

for Physics (AIP) and the American Astronomical Society (AAS). She was awarded in 2018, "For key contributions to the study of the electromagnetic and gravitational wave radiation from binary compact objects."

- *Science Breakthrough of the Year 2017*, for the LIGO Discovery of GW150914and of GW170817.

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