

## Einstein's Cosmic Messengers - Visions & Voices Event

 Tags: [cosmology](#), [einstein](#), [physics](#), [visions\\_voices](#)

This guide is intended to enhance understanding of this event which features a multimedia concert by a composer and a NASA physicist, followed by a panel with them and USC faculty members.

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This Guide

### Cosmic Messenger Event Creators

Text from Visions &amp; Voices

(links from USC Libraries):

"Music and science coalesce in *Einstein's Cosmic Messengers*, a stunning multimedia concert created by composer [Andrea Centazzo](#) and NASA [Jet Propulsion Laboratory] physicist [Michele Vallisneri](#). Following this magnificent journey through the universe, science writer [K.C. Cole](#) will moderate a conversation with Centazzo, Vallisneri and USC cosmology professor [Elena Pierpaoli](#).

Performed live by Centazzo, *Einstein's Cosmic Messengers* tells the story of [gravitational waves](#)—the ripples in the fabric of space and time produced by violent events in the distant universe. [Albert Einstein](#) predicted their existence in 1916; but only in the last two decades have we achieved the technology to detect them, enabling LIGO, the U.S. [Laser Interferometer Gravitational-Wave Observatory](#), and its siblings, to develop a global network of observatories. LIGO's measurements will illuminate the fundamental nature of gravity and throw open an entirely new window onto the universe, offering views of previously inaccessible phenomena such as the coalescence of black holes and neutron stars. They will complement the great discoveries of ground- and space-based astronomy and the investigations of missions such as Planck, which observes the radiation originating from the [Big Bang](#) itself."

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### Science and Art at Visions & Voices

#### *Einstein's Cosmic Messengers*

Visions and Voices



Friday, October 22, 2010 : 8:00pm  
University of Southern California

University Park Campus  
Bovard Auditorium (ADM)

Admission is free.

[Comments \(0\)](#)

### Gravitational Waves Defined

The news site [Science Daily](#) defines a [gravitational wave](#) as: "a fluctuation in the curvature of space-time which propagates as a wave, traveling outward from a moving object or system of objects."

The article goes on to note: "Gravitational radiation is the energy transported by these waves. Important examples of systems which emit gravitational waves are binary star systems, where the two stars in the binary are white dwarfs, neutron stars, or black holes. Although gravitational radiation has not yet been directly detected, it has been indirectly shown to exist."

The Universe Today blog [noted in 2008](#): "Gravitational waves are predicted by Einstein's 1916 General Theory of Relativity, but they are notoriously hard to detect and it's taken many decades to come close to observing them."

[Comments \(0\)](#)

### LIGO Blog Feed

- [BICEP2 Announces First Direct Evidence of Cosmic Inflation](#)
- [LIGO Debuts Two New Information Resources](#)
- [Groundbreaking Ceremony for Gravitational-Wave Detector Project in Japan](#)
- [Squeezed Light Experiment a Glowing Success!](#)
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### Professor Pierpaoli (from her Web page)



- [Elena Pierpaoli](#)

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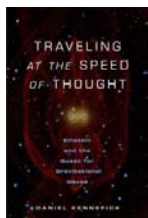
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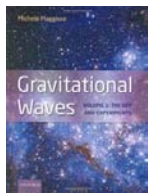
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**Relativity : the special and the general theory - Albert Einstein, 1879-1955**  
 Call Number: Science & Engineering Library: QC173.55.E384513  
 2006  
 ISBN: 0143039822



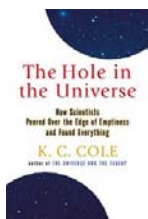
**Traveling at the speed of thought : Einstein and the quest for gravitational waves - Daniel Kennifick**  
 Call Number: Doheny Library: QC179.K46 2007x  
 ISBN: 0691117276



**Gravitational waves. Vol. 1, Theory and experiments - Michele Maggiore**  
 Call Number: Science & Engineering Library: QC179.M34 2008  
 ISBN: 0198570740



**Mind over matter : conversations with the cosmos - K.C. Cole**  
 Call Number: Doheny Library: Q162.C584 2003  
 ISBN: 0151008167



**The hole in the universe : how scientists peered over the edge of emptiness and found everything - K.C. Cole**  
 Call Number: Leavey Library: QC6.C62 2001  
 ISBN: 015100398X

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## Selected Works by percussionist, composer, etc. Andrea Centazzo

- "**The Secret of Joy**" - a tribute to Native Indians Sacred Animals
- "**Sea**" - an homage to the sea and sea creatures
- "**Pictures**" - an anthology

A few links to some of his works in iTunes:

- "**Drops**"
- "**Clangs**"
- "**World Percussion Christmas**"

Comments (0)

## Links to some of Professor Vallisneri's Work

"The Mock LISA Data Challenges: from challenge 3 to challenge 4." Babak, S., et al., incl. Vallisneri. [A physics collaboration-authored work.] *Classical and Quantum Gravity*, v 27, n 8, p 084009 (12 pp.), 21 April 2010. <http://dx.doi.org/10.1088/0264-9381/27/8/084009>

"A LISA data-analysis primer." Vallisneri, M. *Classical and Quantum Gravity*, v 26, n 9, p 094024 (12 pp.), 7 May 2009. <http://dx.doi.org/10.1103/PhysRevD.81.024004>

"Search of S3 LIGO data for gravitational wave signals from spinning black hole and neutron star binary in spirals." Abbott, B. (LIGO, California Inst. of Technol., Pasadena, CA, USA), et al., incl. Vallisneri. [A physics collaboration-authored work.] *Physical Review D*, v 78, n 4, p 042002-1-19, 15 Aug. 2008. <http://dx.doi.org/10.1103/PhysRevD.78.042002>

"Sensitivity and parameter-estimation precision for alternate LISA configurations." Vallisneri, M.; Crowder, J.; Tinto, M. *Classical and Quantum Gravity*, v 25, n 6, p 065005-1-17, 21 March 2008. <http://dx.doi.org/10.1088/0264-9381/25/6/065005>

"Search for gravitational waves associated with 39 gamma-ray bursts using data from the second, third, and fourth LIGO runs." Abbott, B. (LIGO, California Inst. of Technol., Pasadena, CA, USA), et al., incl. Vallisneri. [A physics collaboration-authored work.] *Physical Review D*, v 77, n 6, p 062004-1-22, 15 March 2008. <http://dx.doi.org/10.1103/PhysRevD.77.062004>

All of these citations were found cited in the *Inspec Database*, to which USC subscribes on the *Engineering Village 2 platform*.

Comments (0)

## Links to Some of Professor Pierpaoli's Works

"Optical Design of the EPIC-IM Crossed Dragone Telescope." Huan Tran, et al., incl. Pierpaoli. [A physics collaboration-authored work.]. *Proceedings of the SPIE - The International Society for Optical Engineering*, v 7731, p 77311R (15 pp.), 2010. <http://dx.doi.org/10.1117/12.857423>

"Effects of dark matter decay and annihilation on the high-redshift 21 cm background." Furlanetto, S.R.; Oh, S.P.; Pierpaoli, E. *Physical Review D*, v 74, n 10, p 103502-1-15, 15 Nov. 2006. <http://dx.doi.org/10.1103/PhysRevD.74.103502>

"New cosmic microwave background constraint to primordial gravitational waves." Smith, T.L.; Pierpaoli, E.; Kamionkowski, M. *Physical Review Letters*, v 97, n 2, p 021301/1-4, 14 July 2006. <http://dx.doi.org/10.1103/PhysRevLett.97.021301>

"Impact of dark matter decays and annihilations on reionization." Mapelli, M.; Ferrara, A.; Pierpaoli, E. *Monthly Notices of the Royal Astronomical Society*, v 396, n 4, p 1719-24, 11 July 2006. <http://dx.doi.org/10.1111/j.1365-2966.2006.10408.x>

"Probing the largest scale structure in the Universe with polarization map of galaxy clusters." Seto, N.; Pierpaoli, E. *Physical Review Letters*, v 95, n 10, p 101302/1-4, 2 Sept. 2005. <http://dx.doi.org/10.1103/PhysRevLett.95.101302>

All of these citations were found cited in the *Inspec Database*, to which USC subscribes on the *Engineering Village 2 platform*.

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## Digital Object Identifiers (DOIs)

Note that some of the article citations include the DOI (Digital Object Identifier) links. DOIs are stable Web URLs or Links, assigned by publishers. They are a good way to get right to an article (if USC subscribes to the journal) or to the abstract (if we do not).

To learn more about DOIs, check out this Cross Ref publishers group site:

[http://www.crossref.org/help/Content/01\\_About\\_DOIs/How\\_do\\_DOIs\\_work.htm](http://www.crossref.org/help/Content/01_About_DOIs/How_do_DOIs_work.htm)

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## Thanks!

Thanks to Emily Ross, Civil Engineering Major and Student Assistant for the Libraries' Associate Deans, for help with research for this page.

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### The Project!

[Andrea Centazzo: Einstein's Cosmic Messengers \(excerpts\) from Michele Vallisneri on Vimeo.](#)

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### A definition of gravitational waves (incl. commercial)

[What are gravitational waves](#)

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