The Department of Mechanical Engineering presents:

Chiara Daraio, Ph.D.

Aeronautics and Applied Physics
California Institute of Technology (Caltech)

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From Newton's Cradle to New Materials

Abstract

The bouncing beads of Newton's cradle fascinate children and executives alike, but their symmetric dance hides complex dynamic behavior. Lift a bead on one side off a chain of a few suspended beads, let it swing back: one bead bounces off on the other side. Do the same with a long chain of beads: several beads bounce off on the other side. This represents an example of nonlinear wave dynamics, which can be exploited for a variety of engineering applications. By assembling grains in crystals or layers in composites such that they support nonlinear waves, we are developing new materials and devices with unique properties. We have constructed acoustic lenses that allow sound to travel as compact bullets that can be used in medical applications, have developed new materials for absorbing explosive blasts, and are exploring new ways to test aircraft wings and railroad tracks nondestructively with the help of nonlinear waves.

Biography

Professor Daraio's research aims at designing and testing new materials with unprecedented mechanical properties. She is interested in developing a physical understanding of how stress waves propagate in nonlinear, ordered and disordered solid media at length scales ranging from nanometers to meters. She received her undergraduate degree in Mechanical Engineering from the Universita' di Ancona, Italy (2001). She received her M.S. (2003) and Ph.D. degrees (2006) in Materials Science and Engineering from the University of California, San Diego. Chiara joined the Aeronautics and Applied Physics departments of the California Institute of Technology (Caltech) in fall of 2006, where she now is a full professor. She won several awards. Among these, she received a Sloan Research Fellowship in 2011, she was selected as one of the Brilliant 10 by Popular Science Magazine (2010) and as an ONR Young Investigator (2010). She is a winner of the NSF CAREER award (2009) and the Richard Von Mises Prize (2008).