

## Physical Acoustics and Condensed Matter: Listening to Materials

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From science to business and everyday life, the use of acoustics has been ubiquitous. Following the arrival of fast computing capabilities in ordinary personal computers, acoustics has also found a niche application in a materials scientist's laboratory. Using a "tap-and-ring" approach – known as Resonant Ultrasound Spectroscopy (RUS) – a sample's acoustic resonances can be measured and used to determine all the elastic constants for the material. The latter contain a wealth of information about a material's properties, as changes in the elastic behavior can be connected to magnetic, electronic or structural changes that may take place in the material. RUS also has applications in non-destructive testing. A material's acoustic resonances provide a "fingerprint" that can be used to determine if a part is "good," and looking at deviations in the resonance spectrum from "known good" spectra provides a simple and nondestructive test for quality control. Through various examples, this presentation will illustrate how acoustics has provided an important tool in materials research that has a significant impact on us all, as it connects to science, engineering, quality control, public safety, and more.



**Veerle Keppens** earned her bachelor's degree (1989) and PhD (1995) in Physics from the Katholieke Universiteit Leuven (Belgium). From 1995 to 1998, Dr. Keppens was a Fulbright fellow in the novel materials group at Oak Ridge National Laboratory, where she became interested in the elastic properties of new materials. In 1999, she joined the faculty in the Physics Department at The University of Mississippi. In 2003, she moved back to Tennessee and joined the faculty in the materials

science and engineering department at the University of Tennessee, where she continues to study the elastic properties and lattice dynamics of novel materials. At UT, she has received multiple awards at the departmental, college, and campus level, and in 2011 she became a Fellow of the Acoustical Society of America for the application of ultrasonics to materials physics. She served as the associate dean for faculty affairs from August 2012 till October 2016. In 2015, she became the department head for the department of Materials Science and Engineering and in June of 2016, she was appointed as the director of the Joint Institute for Advanced Materials (JIAM), a position she combines with that of MSE department head.