Mechanical & Materials Engineering
Pierson Graduate Seminar

Acoustic metamaterials: novel structures and new opportunities

Dr. Matthew Guild and Dr. Caleb Sieck
U.S. Naval Research Laboratory, Code 7160, Washington DC 20375

Thursday, October 4, 2018 | 11:00 am | 106 Othmer Hall

Acoustic metamaterials have been a topic of particular interest in recent years, and have enabled extreme macroscopic characteristics such as negative, near-zero or anisotropic dynamic effective fluid properties to be achieved. Through the use of acoustic metamaterials, enhanced capabilities have been envisioned ranging from super-resolution imaging (at scales well below the diffraction limit) to enhanced absorption and even hiding an object by bending sound around it. Such exotic properties are obtained through the judicious design of the microstructure, which make use of simple acoustic elements to create microscale dynamics that result in the desired macroscopic properties. While most of the early basic scientific efforts focused on simple structures with airborne sound, application of acoustic metamaterials to an aqueous environment has presented a host of new design and fabrication challenges. In this talk, relevant examples of how metamaterials can better enable the control or manipulation of acoustic waves will be discussed in detail, with an emphasis on the particular challenges of underwater acoustic metamaterials. [Work supported by the Office of Naval Research.]

About the Speakers:

Dr. Guild is a research scientist in the Acoustics Division at the US Naval Research Laboratory (NRL) in Washington, DC. He received his Ph.D. from the University of Texas at Austin in 2012, followed by post-doctoral research on acoustic metamaterials at the *Universitat Politècnica de València* in Valencia, Spain, and a National Research Council (NRC) post-doctoral research associateship at NRL. In addition to his research, Dr. Guild is also an adjunct professor in the Mechanical Engineering Department at the Catholic University of America in Washington, DC, where he currently teaches a graduate level course on acoustic metamaterials.

Dr. Sieck is a research scientist in the Acoustics Division at the US Naval Research Laboratory (NRL) in Washington, DC. He received his BS in electrical engineering from the University of Arkansas, MS in architectural engineering from the University of Nebraska-Lincoln, and PhD in electrical engineering from The University of Texas at Austin in 2017. Prior to joining NRL as a research scientist, he conducted research on acoustic metamaterials and Willis materials at NRL through the National Research Council Post-doctoral Research Associate Program.

For more information, contact Dr. Joseph Turner at 402-472-8856 or jaturner@unl.edu.

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