

Introduction to the special issue on acoustic metamaterials

Michael R. Haberman

*Applied Research Laboratories and Department of Mechanical Engineering,
The University of Texas at Austin, Austin, Texas 78758, USA*

Andrew N. Norris

Mechanical and Aerospace Engineering, Rutgers University, Piscataway, New Jersey 08854, USA

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Acoustic metamaterials research is an exciting and rapidly expanding topic in the field of acoustics. It has captured the imagination of the scientific community because of the promise to realize physical phenomena which had previously been deemed impossible such as acoustical lenses that defeat the diffraction limit, acoustic cloaks, and devices that enable non-reciprocal wave propagation. In addition to these exotic phenomena, acoustic metamaterials have also been proposed to address long-standing engineering challenges in acoustics such as enhanced acoustic absorption and sound isolation using acoustically small structures. The enhanced performance of acoustic metamaterials stems from engineered subwavelength structure specifically tailored to produce seemingly transgressive behavior such as negative dynamic stiffness and density. The multi-faceted nature of this research has drawn upon expertise in fields as disparate as electromagnetic, acoustic and elastic wave propagation, composite materials, materials science, phononic and photonic crystals, granular media, and additive manufacturing and design. Though wide in scope, the phenomena and applications of acoustic metamaterials are central to a large number of readers of JASA. For this reason, we felt that acoustics metamaterial research is a topic of sufficient interest to merit this Special Issue; the second in less than five years [J. Acoust. Soc. Am. **132**(4), Pt. 2 (2012)].

The breadth of subjects germane to the study of acoustic metamaterials has rapidly expanded in recent years. This is clearly reflected in the contributions to this special issue. Articles included in this collection consider the topics of membrane and plate acoustic metamaterials, leaky-wave antennas, enhanced acoustic absorption, coupled field metamaterials that exploit magnetic and piezoelectric effects, elastic metamaterials based on chiral media, nonlinear acoustic metamaterials, cloaking of acoustic and flexural elastic waves, negative propagation, enhancement of metamaterial anisotropy, transformation acoustics, lenses, non-symmetric wave phenomena, and effective medium theory. Though only a snapshot of ongoing work in the field, we believe that these articles are representative of acoustic metamaterial research and valuable contributions to the field.

As Guest Editors, we would like to thank the editorial staff for their assistance in putting the special issue together in accordance with the standards of the Journal. We would also like to thank the Editor in Chief, James Lynch, for his encouragement and advice. Finally, we would like to extend a special thanks to all of the contributors and reviewers who provided high quality manuscripts that clearly display the breath of ongoing research in the field of acoustic metamaterials. We hope that this collection stimulates further research in this exciting field and we look forward to future contributions to the Journal.