Editorial: Closing the Collection on Phononics and Metamaterials

We launched this Collection on Phononics and Metamaterials to bring together, in one place, the diverse and rapidly evolving strands of research shaping this field—from artificial structures that control sound and vibration in innovative ways to topological phases, space-time modulation, and the growing dialogue between phononics and quantum physics. It was also conceived as a tribute to our friend and colleague Dr. Sarah Benchabane, whose work on surface acoustic waves in structured media left a lasting mark on the community, and whose scientific legacy we wished to honor and carry forward.

We are delighted by how the project has blossomed: 17 articles now make up this ensemble, offering a rich and representative view of the field. Several contributions push wave-based computing and active control forward, from a neuromorphic metasurface capable of running two independent classification tasks at once to optomechanically induced zero-frequency and zero-wave-number band gaps in active elastic metamaterials, to acoustic metasurfaces that steer objects through frequency detuning alone. Others advance our understanding of wave phenomena, including a surprising breakdown of phonon interference in nanoscale phononic crystals, a chiral-state transition effect at topological degeneracies, and fresh insight into bound states in the continuum and their boundary sensitivity. The Collection also captures the field's expanding reach into quantum acoustics and hybrid platforms, with contributions on piezoelectrically transduced phononic waveguides for quantum acoustodynamics, magnon-phonon coupling in magnetic heterostructures, and a unified platform for colocalized photonic and phononic topological edge states. Rounding out the issue are papers addressing pressing applied challenges like underwater noise mitigation, high-frequency Lamb-wave resonators for wireless communication, acoustofluidic particle handling, and lattice metamaterials for sound insulation, and a reminder that this field's conceptual advances continue to translate into real-world impact.

As we close this Collection, we thank the authors who contributed such fine work, the referees whose careful evaluations upheld the journal's rigorous standards, and the *Physical Review Applied* editorial team for their support throughout. We hope this Collection will serve as a lasting reference for the field and, moreover, as a source of inspiration for new collaborations, new questions, and new generations of researchers who approach the study of waves and metamaterials with curiosity, rigor, and generosity, like Sarah did. It has been our privilege to curate this Collection in her memory.

Muamer Kadic
Université Marie et Louis Pasteur
Institut Universitaire de France

Daniel Torrent
Universitat Jaume I

Abdelkrim Khelif
Hamad Bin Khalifa University

Guest Editors

Published 15 October 2026
DOI: 10.1103/28lc-ykvy

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