PHYSICS

Elastic Metamaterial Applications

Funded By	DISAT - Progetti ricerca Unione Europea e Internazionali FONDAZIONE CRT CASSA DI RISPARMIO DI TORINO [P.iva/CF:06655250014]
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Context of the research activity	A PhD position is available in the Wave Dynamics group of the Applied Science and Technology Department (PoliTo) to work on a EU-funded H2020 FET Open project on elastic metamaterials entitled "BOHEME: Bioinspired Hierarchical Metamaterials". The role of PoliTo is to contribute to various work packages: WP2: characterization of the dynamic properties of impact-tolerant biological materials; WP4: Design and optimization of bioinspired hierarchical metamaterials; WP5: applications of hierarchical metamaterials to seismic problems; WP6: applications of hierarchical metamaterials to acoustic noise reduction; WP7: applications of hierarchical metamaterials to nondestructive testing based on nonlinear elasticity.
Objectives	Work will focus on modeling and/or experiments of elastic wave propagation in complex and nonlinear elastic media, and acoustic/elastic metamaterials. These are artificial materials which exhibit unusual dynamic properties such as negative refraction, focusing, cloaking, band gaps, negative effective bulk modulus and mass density, etc. Specific objectives are to investigate dynamic properties of several hierarchical (i.e. that similar structures at different size scales) biological systems in order to identify the potential candidates to inspire the design in terms of geometry, composition and multi-scale structure of the novel elastic metamaterials; to predict wave propagation phenomena associated with these hierarchical architectures; to design simplified metamaterial geometries for specimens fabrication, and to experimentally validate the numerically predicted effects; finally, to apply the novel designs

	for applications in structural health monitoring exploiting nonlinear elastic effects. Particular interest will be focused on the design and fabrication of tunable metamaterials, whose dynamic properties can be varied through external stimuli.

Skills and competencies for the development of the activity	We are looking for motivated candidates with a degree in Physics, Mechanical engineering or equivalent. Experience in any of these topics is welcome: modeling or experiments on elastic wave propagation, acoustic/elastic metamaterials, nonlinear elasticity. Preferred skills are finite element analysis or numerical tools in wave dynamics (numerical background), or ultrasonic measurement techniques and signal treatment and analysis (experimental background).