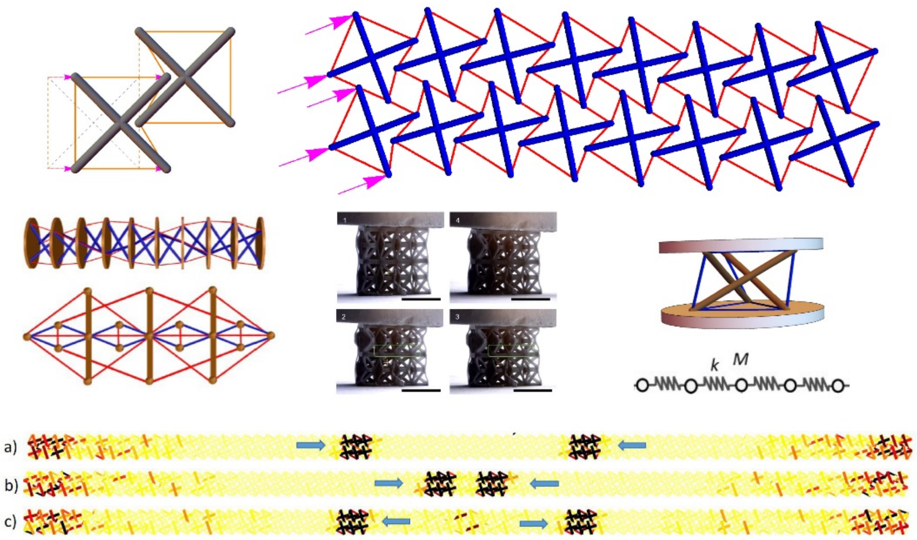
META-MAT.ORG Webinar: **https://meta-mat.org/agenda/**

Seminar 31, Tuesday 02 March 2021, 14:00 (London Time) / 15.00 (Rome Time)

On the compact wave dynamics of tensegrity metamaterials

Speaker: Fernando Fraternali, Department of Civil Engineering University of Salerno, Italy



A research subject attracting remarkable attention from many areas of engineering concerns the use of noninvasive tools to target defects in materials, as well as devices for monitoring structural health in materials and structures. Most of current methods for the focusing and defocusing of acoustic waves (based mainly on exploiting linear acoustic effects) present the problem of having essentially little to no tunability ranges and poorly scalable dimensions. The use of highly nonlinear systems, allowing for a high level of control over the acoustic speed may enable the creation of revolutionary types of devices with far more advanced wave-focusing methodologies.

This talk illustrates the employment of tensegrity metamaterials featuring elastically stiffening/hardening response for the fabrication of tunable focus acoustic lenses or innovative devices for monitoring structural health and damage detection in materials and structures. These devices support extremely compact compression waves in multiple dimensions. Previous research on 1D systems is generalized to 2D and 3D tensegrity beams and plates with stiffening-type response (acting as phononic crystals). The presented results reveal that the dynamics of such systems is characterized by the thermalization of the lattice nearby the impacted regions of the boundary. The portion of the absorbed energy moving along the longitudinal direction is transported by compression waves with compact support. Such waves emerge with nearly constant speed, and slight modifications of their spatial shape and amplitude, after collisions with compression waves traveling in opposite direction.

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