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Kolloquium für Mechanik

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Titel: **Dynamics of granular crystals and locally resonant, acoustic metamaterials**

Abstract

Granular metamaterials are the assembly of discrete solid elements of various shapes arranged in a regular lattice structure. These elements are initially in contact and interact one with another through a highly nonlinear, repulsive contact force. Over the past decade, the dynamic response of granular materials has attracted substantial interest from the researchers of quite different scientific areas for their unique dynamical properties. As is known, these chains support the formation of a new class of propagating, highly localized, elastic stress waves. Recent studies have shown that 1D granular metamaterials can exhibit a very peculiar dynamical behavior such as energy localization, wave entrapment, anomalous reflections, wave redirection and more. In the same studies it was shown that motion of these waves can be efficiently controlled by introducing the local and non-local in-homogeneities in the structure of metamaterial. Thus, properly tuned granular crystals can serve as the unidirectional propagating wave-guides as well as the very efficient shock absorbers. In fact, due to their unique dynamical properties, granular crystals carry the promising potential to be applied in various engineering areas dealing with shock absorption, vibration isolation in micro and macro scales, energy harvesting, fabrication of sound focusing devices as well as delay lines, etc. In general the main objective of the current research activity in the area is in finding the new concepts of passive and semi-active control over the wave propagation in this special class of dynamical systems. As of today, there is a lack of a sufficient theoretical understanding of the dynamics of 1D and 2D granular media which is crucial for a proper design of materials with prescribed dynamical properties. In this presentation, I'll give a broad overview of the intriguing, nonlinear wave phenomena emerging in the response of granular metamaterials as well as the locally resonant structures with a clear emphasis to practical applications.

Alle Interessenten sind herzlich eingeladen.

Prof. Dr.-Ing. Alexander Fidlin