



Ben-Gurion University of the Negev
Blaustein Institutes for Desert Research

The Swiss Institute for Dryland Environmental and Energy Research
Alexandre Yersin Department of Solar Energy and Environmental Physics

Title:

Geometrically frustrated mechanical metamaterials

Speaker:

Dr. Yair Shokef
School of Mechanical Engineering
Tel Aviv University

Abstract:

Mechanical metamaterials are built of repeating macroscopic unit cells, and are designed so that their cooperative local deformations will lead to unusual mechanical behavior at the system level. We focus on three-dimensional structures with anisotropic unit cells. When the orientation of each one is set at random they typically form an aperiodic structure, in which adjacent unit cells may not all deform self-consistently, thus constituting a mechanical spin glass. By mapping to a discrete spin model, we present a combinatorial strategy for the design of a multitude of aperiodic, yet frustration-free metamaterials that exhibit spatially textured functionalities. We demonstrate these by designing three-dimensional metacubes, which when compressed can deform to give any pre-defined texture on their faces. Moreover, we quantitatively explain how pressing on a metacube with the wrong texture increases its overall rigidity.

Tuesday, April 25, 2017, 11:00
Lecture room, Physics Building (ground floor)