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MetaLab Research Group
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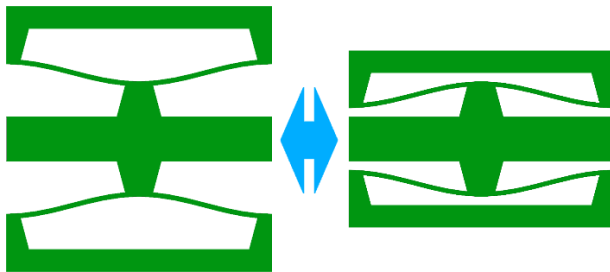
Fatigue in energy-harvesting mechanical metamaterials (HiWi, BSc, MSc)

Mechanical metamaterials are man-made materials engineered to achieve extreme mechanical properties, often beyond those found in most natural materials. The unconventional properties of mechanical metamaterials originate in their sophisticated internal architecture, usually fashioned from repeating unit cells. Therefore, one may control the mechanical response of metamaterials by wisely selecting the underlying architecture.

Rational architecture can be employed not only to “enhance” the mechanical properties of metamaterials but also to realize new functionalities unachievable in conventional materials. Here we will focus on mechanical metamaterials that can harvest elastic energy and store it in the structure thanks to the phenomena of elastic instabilities. The figure below shows the unit cell of such metamaterial that undergoes snap-through behavior under compression. Energy-harvesting mechanical metamaterials have to withstand repeating loading-unloading cycles without deteriorating their performance. In the framework of this project, we will study fatigue properties of metamaterials produced by subtractive and additive manufacturing. It will enable us to search for the optimal geometries and provide recommendations for the future employment of energy-harvesting mechanical metamaterials.

The skills that you can acquire during this project:

1. CAD modeling
2. 3D printing
3. Laser cutting
4. Material characterization and mechanical testing



Please feel free to contact us if you have any questions.

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Living, Adaptive and Energy-autonomous Materials Systems

