



Seminar/Talk

Adaptive locomotion of active solids

Corentin Coulais

University of Amsterdam

Host: Jérémie Palacci

Active systems composed of energy-generating microscopic constituents are a promising platform to create autonomous functional materials that can, for example, locomote through complex and unpredictable environments. Yet coaxing these energy sources into useful mechanical work has proved challenging. Here we engineer active solids based on centimetre-scale building blocks that perform adaptive locomotion. These prototypes exhibit a non-variational form of elasticity characterized by odd moduli, whose magnitude we predict from microscopics using coarse-grained theories and which we validate experimentally. When interacting with an external environment, these active solids spontaneously undergo limit cycles of shape changes, which naturally lead to locomotion such as rolling and crawling. The robustness of the locomotion is rooted in an emergent feedback loop between the active solid and the environment, which is mediated by elastic deformations and stresses. As a result, our active solids are able to accelerate, adjust their gaits and locomote through a variety of terrains with a similar performance to more complex control strategies implemented by neural networks. Our work establishes active solids as a bridge between materials and robots and suggests decentralized strategies to control the nonlinear dynamics of biological systems, soft materials and driven nanomechanical devices.

Thursday, May 15, 2025 03:00pm - 04:00pm

Moonstone Bldg / Ground floor / Seminar Room F (I24.EG.030f)



This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station.

Please find a schedule of the ISTA Shuttle on our webpage:

<https://ista.ac.at/en/campus/how-to-get-here/> The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.