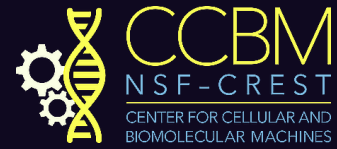




Soft Living Active and Adaptive Matter



Odd dynamics of living chiral crystals

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Abstract:

The emergent dynamics exhibited by collections of living organisms often shows signatures of symmetries that are broken at the single-organism level. At the same time, organism development itself encompasses a well-coordinated sequence of symmetry breaking events that successively transform a single, nearly isotropic cell into an animal with well-defined body axis and various anatomical asymmetries. Combining these key aspects of collective phenomena and embryonic development, we describe here the spontaneous formation of hydrodynamically stabilized active crystals made of hundreds of starfish embryos that gather during early development near fluid surfaces. We describe a minimal hydrodynamic theory that is fully parameterized by experimental measurements of microscopic interactions among embryos. Using this theory, we can quantitatively describe the stability, formation and rotation of crystals and rationalize the emergence of mechanical properties that carry signatures of an odd elastic material. Our work thereby quantitatively connects developmental symmetry breaking events on the single-embryo level with remarkable macroscopic material properties of a novel living chiral crystal system.

Date:
08/15/2022

Time:
9:00 AM-10:15 AM (PT)
12:00 PM-1:15 PM (ET)

About the speaker:

Dr. Alexander Mietke is a DFG Fellow and an EMBO Long-Term postdoctoral fellow in the group of Jörn Dunkel at MIT since 2019. He is interested in the effect of broken symmetries, geometry and mechanical constraints on the self-organization of active matter and often works in close collaboration with experimentalists to study related questions in developmental processes of living systems.

Dr. Mietke has studied Physics and Applied Mathematics at the Technical University of Dresden and at the University of Cambridge and did his PhD with Frank Jülicher at the MPI for the Physics of Complex Systems and with Ivo Sbalzarini at the MPI for Molecular Cell Biology and Genetics in Dresden. In September 2022, he will start his group in the Institute of Applied Mathematics at the University of Bristol.



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