Physics colloquium

Topological Soft Matter

Vincenzo Vitelli
Department of Physics
University of Chicago

Date: **10/12/18**
Time: **10:30 AM**
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For more information contact
Ajay Gopinathan
agopinathan@ucmerced.edu

Abstract: Topological quantum and classical materials can exhibit robust properties that are protected against disorder, for example for non-interacting particles and linear waves. In this colloquium, we review recent theoretical and experimental studies of topologically protected sound waves in mechanical metamaterials and active matter. Next, we demonstrate how to construct topologically protected states that arise from the combination of strong interactions and thermal fluctuations inherent to soft matter. Specifically, we consider fluctuating lines under tension (e.g. polymeric systems), subject to a class of spatially modulated substrate potentials. At equilibrium, the lines acquire a collective tilt proportional to an integer topological invariant called the Chern number. These results point to a new class of classical topological phenomena in which the topological signature manifests itself in an equilibrium structural property rather than a transport measurement.
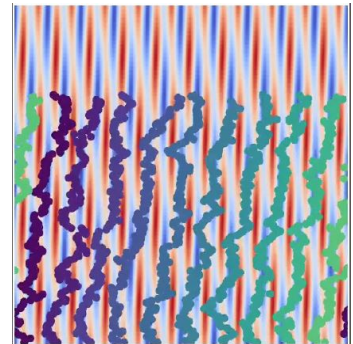
Bio: Vincenzo Vitelli has been a Professor in the Physics Department and the James Franck Institute at the University of Chicago since 2017. Previously he was a Professor in the Institute Lorentz for theoretical physics in Leiden University where he held the Chair of Condensed Matter Theory since 2015.
Vitelli obtained a Bsc in theoretical physics from Imperial College London in 2000 and a Phd in Physics from Harvard University in 2006 working under the supervision of David Nelson. He was a post-doctoral fellow at Upenn from 2006 till 2009.
He was awarded the H. Callan Prize in 2007, he received a Feinberg Foundation Fellowship (Weizmann Institute) in 2009 and was an invited Professor at ESPCI (Juliot Curie Chair) and Ecole Normale, Paris in 2013 and 2015 respectively. In 2018 he became a fellow of the American Physical Society (GSOFT) for theoretical contributions to topological mechanics.