CSU PHYSICS COLLOQUIUM

“Immobile topological quantum matter”

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Monday, August 29th at 4PM

120 Engineering (Hammond Auditorium)

Abstract

I will discuss a burgeoning field of "fractons" - a class of models where quasi-particles are strictly immobile or display restricted mobility. Focussing on just a corner of this fast-growing subject, a will explain how one class of such theories - symmetric tensor gauge theories surprisingly emerge from seemingly mundane elasticity of a two-dimensional quantum crystal. The disclination and dislocation crystal defects respectively map onto charges and dipoles of the fracton gauge theory. This fracton-elasticity duality leads to predictions of fractonic phases and quantum phase transitions to their descendants, that are duals of the commensurate crystal, supersolid, smectic, and hexatic liquid crystals. Extensions of this duality to generalized elasticity theories provide a route to discovery of new fractonic models and their potential experimental realizations.

Biography

Leo’s theoretical research interests span a broad spectrum of classical and quantum condensed matter, ranging from liquid crystals, colloids, membranes, rubber and other "soft" matter to degenerate atomic gases, superconductors, quantum Hall and other topological quantum systems. The unifying theme is the collective universal behavior that emerges at long scales and low energies, driven by a combination of strong interactions, fluctuations, and/or local heterogeneity.