

PHYSICS AND ASTRONOMY COLLOQUIUM

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The reasonable and unreasonable effectiveness of hydrodynamics in exotic quantum matter

Abstract

Hydrodynamics has a long and glorious history, describing phenomena ranging from flows of water, patterns of weather, to star and galaxy formations. During the last decade, it has also played important and often surprising roles in characterizing various types of exotic quantum matter. In particular, it helped formulating a new class of quantum matter: quantum liquids without quasiparticles. I will briefly review these stories and explain physical reasons behind these phenomenal new successes of hydrodynamics. I will then discuss some recent theoretical developments in refor