Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Odd viscosity in chiral active liquids VINCENZO VITELLI, DEBARGHYA BANERJEE, ANTON SOUSLOV, Institute Lorentz, Leiden University, ALEXANDER ABANOV, Stony Brook — Chiral active liquids, composed of self-rotating interacting units, are fluids that break both time reversal symmetry and parity. As a consequence, their viscous stress acquires an additional contribution called odd-viscosity (originally discovered in quantum Hall fluids) that is proportional to the angular momentum density. We construct a non-linear hydrodynamic theory of chiral active fluids, which captures previously neglected odd viscosity contributions. In the incompressible limit, the effect of odd viscosity is to modify the boundary pressure by an additional term proportional to the local vorticity. In the bulk, the odd viscosity affects the response of compressible chiral active fluids by generating transverse currents (with respects to applied pressure) in Burgers shocks. Finally we explore, the chiral vortex formation induced by the active rotation and its implication for the transition to turbulence.

Vincenzo Vitelli
Univ of Leiden

Date submitted: 21 Dec 2016 Electronic form version 1.4