

Chez Pierre

Presents ...

Monday, October 22, 2018

12:00pm Noon

MIT Room 4-331

Chez Pierre Seminar

Hrvoje Buljan, University of Zagreb

“Engineering Anyons and Weyl fermions”

I will present two topics of research in our group related to synthetic topological quantum matter [1]: (i) a proposal for experimental realization of Weyl semimetals in ultracold atomic gases [2], and (ii) anyons [3,4]. I will present one possible route to engineer anyons in a 2D electron gas in a strong magnetic field sandwiched between metamaterials with high magnetic permeability, which induce electron-electron vector potential interactions [3]. I will also discuss intriguing concepts related to extracting observables from anyonic wavefunctions [4]: one can show that the momentum distribution is not a proper observable for a system of anyons [4], even though this observable was crucial for the experimental demonstration of Bose-Einstein condensation or ultracold fermions in time of flight measurements. I will show how time of flight measurements can be used to extract anyonic statistics [4].

[1] N. Goldman, G. Juzeliunas, P. Ohberg, I. B. Spielman, Rep. Prog. Phys. 77, 126401 (2014).

[2] Tena Dubček, Colin J. Kennedy, Ling Lu, Wolfgang Ketterle, Marin Soljačić, Hrvoje Buljan, *Weyl points in three-dimensional optical lattices: Synthetic magnetic monopoles in momentum space*, Phys. Rev. Lett. **114**, 225301 (2015).

[3] M. Todorić, D. Jukić, D. Radić, M. Soljačić, and H. Buljan, The Quantum Hall Effect with Wilczek's charged magnetic flux tubes instead of electrons, Phys. Rev. Lett. **120**, 267201 (2018).

[4] Tena Dubček, Bruno Klajn, Robert Pezer, Hrvoje Buljan, Dario Jukić, Quasimomentum distribution and expansion of an anyonic gas, Phys. Rev. A **97**, 011601(R) (2018).

