Dipartimento di Fisica e Astronomia Galileo Galilei

Università degli Studi di Padova

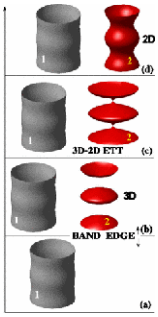
COLLOQUIUM DI FISICA

Giovedì 22 febbraio 2018, ore 15.00
aula "A. Rostagni"

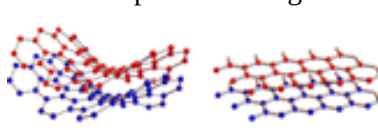
Andrea Perali

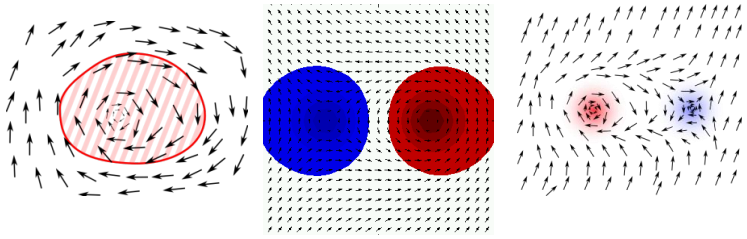
University of Camerino, Italy & International MultiSuper Network

Topological effects in Superconductivity and Superfluidity



Main concepts and experimental characterization of superconductivity and superfluidity in fermionic systems used in this seminar will be summarized. Key defininings properties and classification schemes of topological quantum matter will be given in brief [1]. The role of topology in real and momentum space, focusing on the electronic properties and collective behavior of low dimensional systems will be discussed [1,2]. In two dimensional fermionic systems the superconducting and superfluid phases have a quasi-long range and quasi-condensate character [3], with topological binding of vortex-antivortex pairs driving the so called Kosterlitz-Thouless (KT) phase transition. Adopting a phenomenological approach, the physics of the KT superconducting / superfluid transitions will be explored, including an historical overview [4,5]. The impact of these researches have been recognized by the Nobel prize in Physics in 2016 to Kosterlitz, Haldane, and Thouless for theoretical discoveries of topological phase transitions and topological phases of matter. Relevant examples of two dimensional systems showing a KT transition will be presented: *(i)* theoretical predictions and signatures of electron-hole superfluidity in graphene based heterostructures [6]; *(ii)* superfluidity in squeezed pancakes of ultracold fermionic atoms throughout the BCS-BEC crossover, discussing a comparison between numerical simulations and recent experiments [7,8]. Finally, we will address interesting effects of the curvature of the space (curved systems) on the electronic and superconducting / superfluid properties, opening the way to "Curvatronics" with curved (graphene) layered materials [9].





e-mail: **andrea.perali@unicam.it**
Web sites: **http://www.supercondmat.org/perali** **http://www.multisuper.org**

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