

A pranzo con la Fisica !!!



(aperto a tutti)

Il **terzo** appuntamento del 2011 è per

Giovedì 19 Maggio 2011 dalle ore 13.15 alle ore 14.30

Presso l'aula A del Dipartimento di Fisica

Vittorio Pellegrini

NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, Pisa

“Graphene: An electron wonderland”

The ability to isolate Graphene, a one-atom-thick two-dimensional crystal made by carbon atoms arranged in a honeycomb pattern, and control its electrical properties [1] has led to a revolution in material science and condensed matter physics [2]. Electrons in graphene behave as massless Dirac fermions, the role of the speed of light c being played by the Fermi velocity $v_F \gg c/300$ [3]. This essential feature of electrons in graphene derives from its unusual linear band dispersion [4], ultimately stemming from the underlying honeycomb topology. This basic solid-state effect has led to the unique possibility to test quantum relativistic phenomena in table-top experiments [5]. In the first part of the talk I will review the salient properties of graphene, summarize the main directions of fundamental and applied research and present recent results obtained by our group [6,7]. In the second part of the talk I'll focus on the issue of spontaneous symmetry breaking effects linked to lattice-scale order. These many-body phenomena yield unusual ground states where Dirac quasiparticles are non-uniformly distributed between the two triangular sub-lattices forming the honeycomb pattern [8]. I'll show how these phenomena can be simulated in nanofabricated artificial lattices with honeycomb topology [9,10,11].

- [1] K.S Novoselov *et al.*, *Science* **306**, 5696 (2004).
- [2] A.K. Geim, and K.S Novoselov, *Nature Materials* **6**, 183 (2007).
- [3] K.S. Novoselov, *et al.*, *Nature* **438**, 197 (2005); Y. Zhang, *et al.*, *Nature* **438**, 201 (2005).
- [4] P.R. Wallace, *Phys. Rev.* **71**, 622 (1947).
- [5] N. Stander *et al.*, *Phys. Rev. Lett* **102**, 026807 (2009).
- [6] A. Bostwick, *Science* **328**, 999 (2010).
- [7] J. Yan *et al.*, *Phys. Rev. Lett* **105**, 227401 (2010).
- [8] Z.Y. Meng *et al.*, *Nature* **464**, 847 (2010).
- [9] M. Gibertini *et al.*, *Phys. Rev. B Rapid Comm* **79**, 241406 (2009).
- [10] G. De Simoni, *et al.*, *Appl. Phys. Lett.* **97**, 132113 (2010).
- [11] A. Singha, *et al.* submitted

Non mancate !!!