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CENTER FOR THEORETICAL PHYSICS



# Sommerfeld Theory Colloquium

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## Optics of Electric Flows in Graphene

In optics, transparent interfaces between materials are used in lenses and prisms to manipulate light beams. So far, interfaces have played rather different role in semiconductor electronics, where the central place was, for a long time, occupied by the  $p$ - $n$  junction. Due to a depletion region near the contact between the two semiconductors (and a large energy gap), conventional  $p$ - $n$  junctions are not suitable for precision manipulation of electron beams, which, if realized, may lead to new functionality in microelectronics. From this perspective a lot of promise is offered by a recently discovered truly two-dimensional gapless semiconductor – graphene. On the one hand, the  $p$ - $n$  junction in graphene is highly transparent for the charge carriers. On the other hand, the transmission of electrons through the  $p$ - $n$  interface resembles optical refraction at the surface of metamaterials with *negative refractive index*: the straight interface is able to focus electric current! We will consider the specifics of the graphene and possible ideas of the devices based on the  $p$ - $n$  junctions in this material. The talk is partially based on the recently published paper: V.V. Cheianov, V.I. Falko and B.L. Altshuler, *Science*, v. 315, p. 1252 (2007)

Wednesday, 11<sup>th</sup> June 08, 11:15 h, Room 348 / 349, Theresienstr. 37 / III