Edge engineering in graphene devices

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Graphene's ability to support ballistic transport of electrons is behind some of the most exciting new scientific discoveries as well as a key aspect of graphene's possible use for next-generation electronics and sensors. In ballistic devices, however, the edges play a dominant role, and the difficulty in defining edges with sufficiently small amounts of disorder has been a serious challenge for more than a decade, and one of the main reasons for the slow progress in creating high-performance nanoscale graphene devices. In this talk I will overview three recent examples of how engineering of graphene edges can influence the transport properties in exciting ways: suppression of quantum Hall effect in low-disorder nanoconstrictions, ferroelectric molecular switching and gate-edge electrostatics, and ultra-dense lithographic superlattices with magneto-tunable bandgaps.