Erik Henriksen

2d crystalline donors and acceptors: how a quantum spin liquid leads to modulation doping in atomically-thin heterostructures

Abstract:
a-RuCl3 is a layered antiferromagnetic Mott insulator widely thought to host a close relative of the Kitaev quantum spin liquid state. It can be exfoliated down to monolayer thicknesses and incorporated into van der Waals heterostructures along with graphene and myriad other atomically thin materials. Proximity of a-RuCl3 to graphene (and other materials) leads to a significant charge transfer between the two that, surprisingly, persists even when a thin insulating layer is inserted between them, a phenomenon analogous to modulation doping in epitaxially-grown semiconductors. This heralds a new method of charge control in van der Waals stacks: we envision the construction of layered devices with both p- and n-type doping to recapitulate modern computing technology in atomically thin materials. We illustrate this potential with evidence for ultra-sharp pn junctions.

Bio:
Erik Henriksen attended Swarthmore College and, after stints as a research technician in Michael Roukes' lab at Caltech and building the cleanroom at Columbia U., he stayed on at Columbia to pursue a PhD under Horst Stormer. This was followed by postdoctoral work in the lab of Jim Eisenstein, back at Caltech. Since 2013 he has been on the faculty of the Physics Dept. at Washington University in St. Louis, where he works on various aspects of the physics of atomically-thin materials.