Tobias Meng
Fractional topological phases in three-dimensional coupled-wire systems
arXiv:1506.01364

It is shown that three-dimensional systems of coupled quantum wires support fractional topological phases composed of closed loops and open planes of two-dimensional fractional quantum Hall subsystems. These phases have topologically protected edge states, and are separated by exotic quantum phase transitions corresponding to a rearrangement of fractional quantum Hall edge modes. It is speculated that also an extended exotic critical phase may exist. Without electron-electron interactions, similar but unfractionalized bulk gapped phases based on coupled integer quantum Hall states exist. They are separated by an extended critical Weyl semimetal phase.

David F. Mross, Andrew Essin, Jason Alicea, Ady Stern
Anomalous Quasiparticle Symmetries and Non-Abelian Defects on Symmetrically Gapped Surfaces of Weak Topological Insulators
arXiv:1507.01587

We show that boundaries of 3D weak topological insulators can become gapped by strong interactions while preserving all symmetries, leading to Abelian surface topological order. The anomalous nature of the weak topological insulators manifests itself in a non-trivial action of symmetries on the quasiparticles; most strikingly, translations change the anyon types in a manner impossible in strictly 2D systems with the same symmetry. As a further consequence, screw dislocations form non-Abelian defects that trap $\mathbb{Z}4$ parafermion zero modes.

Kelly A. Walker, Nicolas Vogt, Jared H. Cole
Charge filling factors in clean and disordered arrays of tunnel junctions
arXiv:1507.04801

We simulate one-dimensional arrays of tunnel junctions using the kinetic Monte Carlo method to study charge filling behaviour. By applying a small fixed voltage bias and varying the offset voltage, we investigate this behaviour in both clean and disordered arrays as a function of array and charge interaction length. The charge modulation of the current is highly sensitive to background charge disorder. We show that while small fractional charge filling factors are likely to be washed out in experimental devices due to strong background charge disorder, larger factors may be observable.

D. J. Kim, J. G. Connell, S. S. A. Seo, A. Gruverman
Domain wall conductivity in semiconducting hexagonal ferroelectric TbMnO$_3$ thin films
arXiv:1507.04864

Although enhanced conductivity at ferroelectric domain boundaries has been found in BiFeO$_3$ films, Pb(Zr,Ti)O$_3$ films, and hexagonal rare-earth manganite single crystals, the mechanism of the domain wall conductivity is still under debate. Using conductive atomic force microscopy, we observe enhanced conductance at the electrically-neutral domain walls in semiconducting hexagonal ferroelectric TbMnO$_3$ thin films where the structure and polarization direction are strongly constrained along the c-axis. This result indicates that domain wall conductivity in ferroelectric rare-earth manganites is not limited to charged domain walls. We show that the observed conductivity in the TbMnO$_3$ films is governed by a single conduction mechanism, namely, the back-to-back Schottky diodes model tuned by the segregation of defects.

U. Wurstbauer, A. L. Levy, A. Pinczuk, K. W. West, L. N. Pfeiffer, M. J. Manfra, G. C. Gardner, J. D. Watson
Gapped Excitations of unconventional FQHE states in the Second Landau Level
arXiv:1507.04939

We report the observation of low-lying collective charge and spin excitations in the second Landau level at $ \nu = 2+1/3$ and also for the very fragile states at $\nu = 2+2/5$, $2+3/8$ in inelastic light scattering experiments. These modes exhibit a clear dependence on filling factor and temperature suggesting incompressible quantum states. A detailed mode analysis reveals low energy modes at around 70 μeV and a rather sharp mode slightly below the Zeeman energy interpreted as gap and spin wave excitation, respectively. The striking polarization dependence in light scattering is discussed in the framework of stabilization of nematic FQHE states in the second Landau level.