**Phase separation in doped Mott insulators**
*Chuck-Hou Yee, Leon Balents*

*arXiv:1407.0368*
Motivated by the commonplace observation of Mott insulators away from integer filling, we construct a simple thermodynamic argument for phase separation in first-order doping-driven Mott transitions. We show how to compute the critical dopings required to drive the Mott transition using electronic structure calculations for the titanate family of perovskites, finding good agreement with experiment. The theory predicts the transition is percolative and should exhibit Coulomb frustration.

---

**Quantum Kagome Ice**
*Juan Carrasquilla, Zhihao Hao, Roger G. Melko*
*arXiv:1407.0037*
Actively shought since the turn of the century, two-dimensional quantum spin liquids (QSLs) are exotic phases of matter where magnetic moments remain disordered even at extremely low temperatures. (...) Here, we study a theoretical model for a broad class of frustrated magnetic rare-earth pyrochlore materials called "quantum spin ices". When subject to an external magnetic field along the [111] crystallographic direction, the resulting spin interactions contain a mix of geometric frustration and quantum fluctuations in decoupled two-dimensional kagome planes. Using large-scale quantum Monte Carlo simulations, we identify a simple set of interactions sufficient to promote a groundstate with no magnetic long-range order, and a gap to excitations, consistent with a $\mathbb{Z}_2$ spin liquid phase. (...)

---

**Coherent control of single spins in silicon carbide at ambient condition**
*Matthias Widmann, Sang-Yun Lee, Torsten Rendler, Nguyen Tien Son, Helmut Fedder, Seoyoung Paik, Nan Zhao, Sen Yang, Ian Booker, Andrej Denisenko, Mohammad Jamali, Seyed Ali Momenzadeh, Takeshi Ohshima, Adam Gali, Erik Janzén, Jörg Wrachtrup*
*arXiv:1407.0180*
Spins in solids are cornerstone elements of quantum spintronics. Leading contenders such as defects in diamond, or individual phosphorous dopants in silicon have shown spectacular progress but either miss established nanotechnology or an efficient spin-photon interface. Silicon carbide (SiC) combines the strength of both systems: It has a large bandgap with deep defects and benefits from mature fabrication techniques. Here we demonstrate optical detection of single silicon vacancies as well as optical spin polarization and addressing of single spins at room temperature. We show coherent control of a single defect spin and find spin coherence times of $80\,\mu$s under ambient conditions. Our study provides evidence that SiC is a promising system for atomic-scale spintronics and quantum technology.

---

**Tunneling transport in NSN junctions made of Majorana nanowires across the topological quantum phase transition**
*Alejandro M. Lobos, S. Das Sarma*
*arXiv:1407.0694*
We theoretically consider transport properties of a normal metal (N)- superconducting semiconductor nanowire (S)-normal metal (N) structure (NSN). (...) Our theory includes the realistic nonperturbative effects of disorder, (...), and (...) the transparency at the tunneling NS contacts (...). We show that in the presence of generic disorder and barrier transparency the interpretation of the zero bias peak as being associated with the Majorana bound state is problematic since the nonlocal correlations between the two NS contacts at two ends may not manifest themselves in the tunneling

conductance through the whole NSN structure. We establish that a simple modification of the standard transport measurements using conductance differences (...) can allow direct observation of the nonlocal correlations inherent in the Majorana bound states (...)

---

**Interaction-Induced Renormalization of Tunneling into Multiple Majorana End States of a Topological Superconducting Wir**
*Oleksiy Kashuba, Carsten Timm*
*arXiv:1407.1145*

---

**Direct Probe of Topological Order for Cold Atoms**
*Deng Dong-Ling, Wang Shengtao, Lu-Ming Duan*
*arXiv:1407.1146*

---

**Topological s-wave pairing superconductivity with spatial inhomogeneity: Mid-gap-state appearance and Anderson's theorem**
*Yuki Nagai, Yukihiro Ota, Masahiko Machida*
*arXiv:1407.1125*

---

**Anisotropic Fabry-Pérot resonant states confined within nano-steps on the topological insulator surface**
*Zhen-Guo Fu, Ping Zhang, Mu Chen, Zhigang Wang, Fa-Wei Zheng, Hai-Qing Lin*
*arXiv:1407.1105*

---

**Boundary Conditions for Effective Hamiltonian and Surface States in 2D and 3D Topological Insulators**
*V.V. Enaldiev, I.V. Zagorodnev, V.A. Volkov*
*arXiv:1407.0945*

---

**Triplet superconductivity in 3D Dirac semimetal due to exchange interaction**
*Baruch Rosenstein, B. Ya. Shapiro, Dingping Li, I. Shapiro*
*arXiv:1407.0770*

---

**Fermionic Quantum Critical Point of Spinless Fermions on a Honeycomb Lattice**
*Lei Wang, Philippe Corboz, Matthias Troyer*
*arXiv:1407.0029*

---

**Detailed balance and entanglement**
*Rocco Duvenhage, Machiel Snyman*
*arXiv:1407.0520*