1. **Time-Reversal Invariant Topological Superconductivity Induced by Repulsive Interactions in Quantum Wires**
   Arbel Haim, Anna Keselman, Erez Berg and Yuval Oreg
   arXiv:1310.4525

   We consider a model for a one-dimensional quantum wire with Rashba spin-orbit coupling and repulsive interactions, proximity coupled to a conventional s-wave superconductor. Using a combination of Hartree-Fock and density matrix renormalization group calculations, we show that for sufficiently strong interactions in the wire, a time-reversal invariant topological superconducting phase can be stabilized in the absence of an external magnetic field. This phase supports two zero energy Majorana bound states at each end, which are protected by time-reversal symmetry. The mechanism for the formation of this phase is a reversal of the sign of the effective pair potential in the wire, due to the repulsive interactions...

2. **Interplay of Rashba/Dresselhaus spin splittings probed by photogalvanic spectroscopy (review)**
   Sergey D. Ganichev, Leonid E. Golub
   arXiv:1310.4089

   The paper reviews the interplay of Rashba/Dresselhaus spin splittings in various two dimensional systems made of III-V, wurtzite and SiGe. We discuss the symmetry aspects of the linear and cubic in electron wavevector spin splitting in heterostructures prepared on (001)-, (110)-, (111)-, (113)-, (112)-, and (013)- oriented substrates and address the requirements for suppression of spin relaxation and realization of the persistent spin helix state. In experimental part of the paper we overview experimental results on the interplay of Rashba/Dresselhaus spin splittings probed by photogalvanic spectroscopy: the method based on the phenomenological equivalence of the linear-in-wavevector spin splitting and several photogalvanic phenomena.

3. **Ferromagnetic exchange, spinorbit coupling and spiral magnetism at the $LaAlO_3/SrTiO_3$ interface**
   S. Banerjee, O. Erten and M. Randeria
   Nature Physics 9, 626, (2013)

   ...An exciting development is the observation of robust magnetism at the interface of two non-magnetic materials, $LaAlO_3$ and $SrTiO_3$. Here we present a microscopic theory for the formation and interaction of local moments that depends on essential features of the $LaAlO_3/SrTiO_3$ interface. We show that correlation-induced moments arise owing to interfacial splitting of orbital degeneracy. We find that conduction electrons with a gate-tunable Rashba spinorbit coupling mediate ferromagnetic exchange with a twist. We predict that the zero-field ground state is a long-wavelength spiral...

4. **Discovery of a Superhard Iron Tetraboride Superconductor**
   H. Gou et al.
   PRL 111, 157002 (2013)

   Single crystals of novel orthorhombic (space group Pnnm) iron tetraboride FeB_4 were synthesized at pressures above 8 GPa and high temperatures. Magnetic susceptibility and heat capacity measurements demonstrate bulk superconductivity below 2.9 K. The putative isotope effect on the superconducting critical temperature and the analysis of specific heat data indicate that the superconductivity in FeB_4 is likely phonon mediated, which is rare for Fe-based superconductors. The discovered iron tetraboride is highly incompressible and has the nanoindentation hardness of 62(5) GPa; thus, it opens a new class of highly desirable materials combining advanced mechanical properties and superconductivity.

5. **Giant Magnetodrag in Graphene at Charge Neutrality**
   M. Titov, R.V. Gorbachev, B. N. Narozhny, T. Tudorovskiy, M. Schutt, P. M. Ostrovsky, I.V. Gornyi, A. D. Mirlin, M. I. Katsnelson, K. S. Novoselov, A. K. Geim, and L. A. Ponomarenko
   PRL 111, 166601 (2013)

   We report experimental data and theoretical analysis of Coulomb drag between two closely positioned graphene monolayers in a weak magnetic field. Close enough to the neutrality point, the coexistence of electrons and holes in each layer leads to a dramatic increase of the drag resistivity. Away from charge neutrality, we observe nonzero Hall drag. The observed phenomena are explained by decoupling of electric and quasiparticle currents which are orthogonal at charge neutrality. The sign of magnetodrag depends on the energy relaxation rate and geometry of the sample.

6. **Fully gapped topological surface states in Bi_2Se_3 films induced by a d-wave high-temperature superconductor**
   E. Wang et al.
   Nature Physics 9, 621, (2013)

... by growing high-quality topological insulator Bi_2Se_3 films on a d-wave superconductor $Bi_2Sr_2CaCu_2O_{8+\delta}$using molecular beam epitaxy, we are able to induce high-temperature superconductivity on the surface states of Bi_2Se_3 films with a large pairing gap up to 15meV. Interestingly, distinct from the d-wave pairing of $Bi_2Sr_2CaCu_2O_{8+\delta}$, the proximity-induced gap on the surface states is nearly isotropic and consistent with predominant s-wave pairing as revealed by angle-resolved photoemission spectroscopy.

7. **Anisotropic Weyl Fermions from Quasiparticle Excitation Spectrum of a 3D Fulde-Ferrell Superfluid**
   Yong Xu, Ruilin Chu, and Chuanwei Zhang
   arXiv:1310.4100

   ...we show that Weyl semimetals also exist in the quasiparticle excitation spectrum of a three-dimensional spin-orbit coupled Fulde-Ferrell superfluid. By varying Zeeman fields, the properties of Weyl fermions, such as their creation and annihilation, number and position, as well as anisotropic linear dispersions around band touching points, can be tuned. We study the manifestation of anisotropic Weyl fermions in sound speeds of Fulde-Ferrell fermionic superfluids, which are detectable in experiments.

8. **Cyclotron resonance of single valley Dirac fermions in gapless HgTe quantum well**
   J. Ludwig et al.
   arXiv:1310.5036

   We report on Landau level spectroscopy studies of two HgTe quantum wells near or at the critical well thickness, where the band gap vanishes. In magnetic fields up to B=16 T, oriented perpendicular to the QW plane, we observe a $\sqrt{B}$ dependence for the energy of the dominant cyclotron resonance (CR) transition characteristic of two-dimensional Dirac fermions. The dominant CR line exhibits either a single or double absorption line shape for the gapless or gapped QW...

9. **Electrical Detection of Direct and Alternating Spin Current Injected from a Ferromagnetic Insulator into a Ferromagnetic Metal**
   P. Hyde et al.
   arXiv:1310.4840

   We report room temperature electrical detection of spin injection from a ferromagnetic insulator (YIG) into a ferromagnetic metal (Permalloy, Py). Non-equilibrium spins with both static and precessional spin polarizations are dynamically generated by the ferromagnetic resonance of YIG magnetization, and electrically detected by Py as dc and ac spin currents, respectively. The dc spin current is electrically detected via the inverse spin Hall effect of Py, while the ac spin current is converted to a dc voltage via the spin rectification effect of Py which is resonantly enhanced by dynamic exchange interaction between the ac spin current and the Py magnetization. Our results reveal a new path for developing insulator spintronics, which is distinct from the prevalent but controversial approach of using Pt as the spin current detector.