## Non-disipative Magnetoelectric Effects: Charge-Spin Coupling in Superconducting Structures

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This lecture presents an overview of the theory of non-dissipative magnetoelectric effects in hybrid superconducting structures with spin-orbit coupling (SOC). I will demonstrate a close connection between "classical spin-orbitronics" effects in normal systems and coherent transport phenomena mediated by SOC in superconductors. I start with an introduction to magnetoelectric effects in normal conductors with SOC, and to the standard quasiclassical theory of superconducting structures. By combining the ideas from these two fields we develop a theory of diffusive superconductors in the presence of SOC, and analyze a number of specific magnetoelectric effects. In particular we consider the generation of the long-range triplet condensate, the supercurrent induced spin/triplet accumulation, and the anomalous Josephson effect. We will see that these effects are the direct phase-coherent counterparts of the persistent spin helix, the spin Hall effect, the Edelstein effect, and the spin-galvanic effect, which are known for normal conductors.

## References

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