Chez Pierre

Presents ...

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"Polarized Fermi superfluids"

The two-component Fermi gas is the canonical fermionic system exhibiting pairing phenomena and superfluidity and, as such, has relevance to a range of different fields in physics. Ultracold atomic gases provide an exceptionally clean realization of this system, since the interatomic interactions and atom spin are both independently tunable. Indeed, we expect particularly rich scenarios when the populations of each spin are imbalanced, because then the pairing among fermions is frustrated.

In this talk, I will investigate the phase diagram of this spin-polarized Fermi superfluid, with particular attention to how the inherent frustration within the system is resolved. I will show that there exists a region of phase separation between superfluid and normal states that touches the boundary of second-order superfluid transitions at a tricritical point, reminiscent of the phase diagram of Helium-3/Helium-4 mixtures. Moreover, I will argue that even more exotic superfluid phases may be realized by embedding the atomic Fermi gas in a two-dimensional array of weakly-coupled "tubes", generated via an optical lattice.