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What do we know about the state of cold fermions in the unitary regime?

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A gas of interacting fermions is in the unitary regime if the average separation between particles is large compared to their size, but small compared to their scattering length. Until recently the only physical realization was perhaps in neutron stars, but now experiments with trapped atoms have brought these unique systems into the laboratory. Such gases are strongly interacting many-body systems. From the theoretical point of view the properties of a fermion system in the unitary regime are remarkable, often being referred to as universal. Such a system is at the crossroad between a fermion and a boson superfluids, or what is called the BCS to BEC crossover. From the experimental point of view the fact that basically all parameters of such a system can be tunned essentially at will make these systems unique in physics, realizing for the first time many thought experiments envisioned by theorists over the years. The theorists are at the verge at describing fully and extremely accurately from first principles the properties of these strongly interacting many fermion systems. Many of the experimental results obtained so far are consistent with the theoretical expectation that these systems are superfluid. However, the existence of a superflow as such has not been put in evidence in experiments, yet! In this talk I shall review the basic experimental results obtained so far and confront them with our most detailed theoretical description available at this time.