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Polaron dynamics in strongly correlated systems[1]

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The polaron problem describes the behavior of a single impurity immersed in a many-body background. Introduced first to describe the interaction of an electron with the acoustic excitations of a lattice, it is more generally the simplest, non-trivial many-body system and can be used as a test-bed for advanced quantum-many body theories. In this talk I will describe recent experiments on the interaction of a bosonic impurity with a strongly-correlated fermionic superfluid. In the regime of weak interspecies coupling, I will show that the study of the dynamics [1,2] as well as the lifetime of the impurity [3] can be used as a quantitative probe of both macroscopic and microscopic properties of the surrounding medium. [1] I. Ferrier-Barbut, M. Delehaye, S. Laurent, A.T. Grier, M. Pierce, B.S. Rem, F. Chevy, C. Salomon, Science 345, 1035 (2014) [2] M. Delehaye, S. Laurent, I. Ferrier-Barbut, S. Jin, F. Chevy, C. Salomon, Phys. Rev. Lett. 115, 265303 (2015 [3] S. Laurent, M. Pierce, M. Delehaye, T. Yefsah, F. Chevy, C. Salomon, Phys. Rev. Lett. 118, 103403 (2017)

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