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**Exploring the nonequilibrium dynamics of ultracold quantum gases by using numerical tools**[1]

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Numerical tools such as exact diagonalization or the density matrix renormalization group method have been vital for the study of the nonequilibrium dynamics of strongly correlated many-body systems. Moreover, they provided unique insight for the interpretation of quantum gas experiments, whenever a direct comparison with theory is possible. By considering the example of the experiment by Ronzheimer et al. [1], in which both an interaction quench and the release of bosons from a trap into an empty optical lattice (sudden expansion) was realized, I discuss several nonequilibrium effects of strongly interacting quantum gases. These include the thermalization of a closed quantum system and its connection to the eigenstate thermalization hypothesis [2], nonequilibrium mass transport [1], dynamical fermionization [3], and transient phenomena such as quantum distillation or dynamical quasicondensation [4]. I highlight the role of integrability in giving rise to ballistic transport in strongly interacting 1D systems [1] and in determining the asymptotic state after a quantum quench [5]. The talk concludes with a perspective on open questions concerning 2D systems and the numerical simulation of their nonequilibrium dynamics [6].

[1] Ronzheimer et al., Phys. Rev. Lett. 110, 205301 (2013)
[2] Sorg et al., Phys. Rev. A 90, 033606 (2014)
[3] Vidmar et al., Phys. Rev. B 88, 235117 (2013)
[4] Vidmar et al., Phys. Rev. Lett. 115, 175301 (2015)
[5] Mei et al., arXiv:1509.00828
[6] Hauschild, Pollmann, FHM, arXiv:1509.00696

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