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Abstract for an Invited Paper
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Exploring many-body physics in tunable arrays of single Rydberg atoms

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I will report on experiments in which we generate arrays of up to 70 optical tweezers arranged in arbitrary geometries in 1, 2 and 3 dimensions, each containing a single cold atom, and separated by distances of a few micrometers. This is achieved by active sorting of atoms in larger arrays that are initially loaded stochastically. By exciting the atoms to Rydberg states with principal quantum numbers in the range 50100, we can induce strong, tunable dipolar interactions between the atoms. This system is an ideal platform for studying the many-body physics of spin Hamiltonians. By using the van der Waals interaction, we implement the quantum Ising model in a transverse field and observe the dynamics of the magnetization and of correlation functions following either a quantum quench, either quasi-adiabatic sweeps. Using the resonant dipole-dipole interaction, we observe and control the propagation of a spin excitation in a spin chain governed by the XY spin Hamiltonian.