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Abstract for an Invited Paper
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Controlled Interaction Between Pairs of Atoms in a Double-Well Optical Lattice

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I will describe recent experiments studying ultra-cold atoms in a dynamic, double-well lattice. Using this lattice, we are able to isolate arrays of atom pairs, and separately control the internal states of the atoms in each pair. By controlling interactions between the atoms we are able to induce a controlled exchange interaction between the two atoms, the essential feature of a quantum SWAP gate. Such a lattice provides a test-bed for ideas in neutral atom quantum computing, and a flexible platform for simulating correlated many-body physics.