**Quantum Simulators with Two Species of Atoms: Progress, Challenges, and Future Applications**

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Atoms are ideal quantum objects; they are abundant in nature, and each atom of the same kind is perfectly identical. For decades, scientists have used atoms in quantum simulations, leading to the observation and study of numerous important phenomena in quantum physics. These include the Superfluid-Mott insulator transition, Tonks-Girardeau gas, BEC-BCS crossover, and BKT transition in 2D systems. As our ability to control these simulators advances, we are also seeking to incorporate additional complexities, such as the integration of a second atomic species. In this talk, I will discuss on our progress in creating a quantum simulator with two species of atoms and outline our plans for future applications.