

Invited talk

## New frontiers in quantum simulation and sensing via photon mediated interactions

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In this talk, I will discuss the potential of atomic systems loaded in optical cavities as a resource to enhance the energy scales needed to observe complex many-body behaviors by harnessing infinity range interactions mediated by photons that can couple a large set of internal levels. I will show how cavity systems can help us not only to shed light on behaviors of iconic Hamiltonians describing real materials but also to engineer broader classes of Hamiltonians with multi-body interactions too complex to emerge naturally. Furthermore, I will explain how they can facilitate the generation of quantum entanglement and overcome physical constraints currently limiting the performance of state-of-the-art atomic clocks and interferometers.