

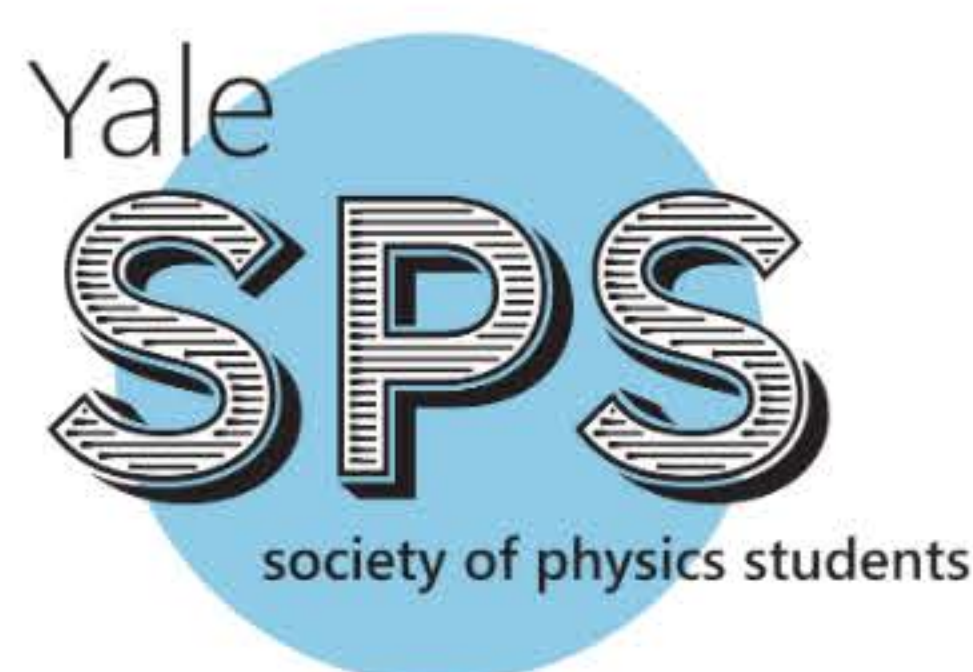
Yale Society of Physics Students Presents  
The 3rd Annual Howard L. Schultz Senior Prize Lecture

# Choreographing Quantum Spin Dynamics with Light

The power of quantum information lies in its capacity to be non-local, encoded in correlations among entangled particles. Yet our ability to produce, understand, and exploit such correlations is hampered by the fact that the interactions between particles are ordinarily local. I will report on experiments in which we use light to engineer non-local interactions among cold atoms, with photons acting as messengers conveying information between them. We program the spin-spin couplings in an array of atomic ensembles by tailoring the frequency spectrum of an optical control field. We harness this programmability to access interaction graphs conducive to frustration and to explore quantum spin dynamics in exotic geometries and topologies. More broadly, advances in optical control of interactions open new opportunities in areas ranging from quantum technologies to fundamental physics. I will touch on implications for quantum-enhanced sensing, combinatorial optimization, and simulating quantum gravity.



Presented by  
**Monika Schleier-Smith**  
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Lecture and extended Q&A  
May 3rd, 2021  
4:30pm (ET) / 1:30pm (PT)

Zoom Link: [tinyurl.com/YaleSPS21](https://tinyurl.com/YaleSPS21)

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