

## **Tracy Northup**

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### *A Quantum Bridge Between Light And Matter*

Quantum states are both powerful and fragile. New frontiers for quantum technologies — for quantum computing, communication, and sensing — are emerging based on quantum superposition and entanglement, but to harness these opportunities, we will need the capability to transfer these states between light-based and matter-based encodings. I will discuss the special role that optical cavities can play as quantum interfaces, that is, as bridges between quantum light and quantum matter. Starting with recent proof-of-principle experiments to transfer information between trapped ions and photons, a vision for future quantum networks will be presented. I will also describe how ion-trap quantum interfaces enable the preparation of novel quantum states of motion, offering fundamental insights into the boundary between the classical and quantum worlds.