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**Extending the quantum domain with quantum optical systems**

Quantum optical systems are particularly well suited to pushing the boundaries of the domain where basic quantum effects such as superposition and entanglement have been observed. I will focus on two examples. First, I will describe a proposal to create entanglement over global distances by combining satellite-based quantum communication links and so-called quantum repeaters. I will highlight the need for quantum non-demolition measurements of photonic qubits in this context and describe an idea for realizing such measurements. Second, I will discuss recent proposals and experiments on the creation and detection of entangled states involving macroscopic numbers of photons (experimental) and phonons (theoretical for now). A common element playing a key role in both examples is the storage of quantum states of light in material systems.