**Quantum Computation with Ions and Photons**

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Trapped atomic ions have proven to be one of the most viable candidates for quantum information processing. Integrating ions (quantum memory) with photons (information carriers) offers a unique path to large-scale quantum computation. Recently, we have implemented a heralded photon-mediated quantum gate between remote ions, and employed this gate to perform a teleportation protocol between two ions separated by a distance of about one meter. The method demonstrated here avoids many of the issues associated with previously demonstrated motional gates, while presenting a new set of challenges and possibilities for integration to larger systems.