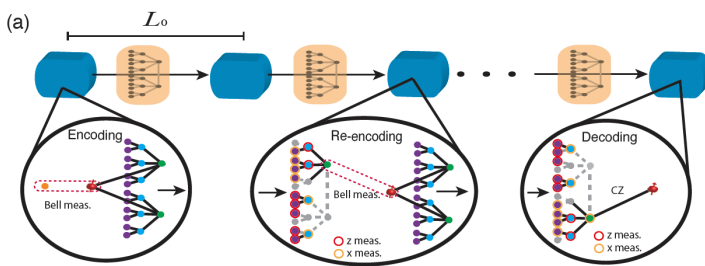


## Highlights: Center for Hybrid Quantum Networks (Hy-Q)

### Research highlights

There has been continuous progress on the experimental platforms within Hy-Q as well as on the theoretical explorations and development of quantum-information protocols. We have developed a novel architecture for a “one-way quantum repeater” (cf. inserted figure) that is tailored to the hardware developed in Hy-Q. A quantum repeater will enable long-distance quantum communication, which is an essential missing component of the quantum internet. Our in-depth feasibility study constitutes a blueprint of how to construct a quantum repeater by scaling-up our single-photon sources. To this end, we have experimentally generated >100 high-fidelity single-photon qubits with our next-generation quantum-dot sources. This is an important milestone towards quantum repeaters as well as for constructing photonic quantum simulators targeting quantum chemistry problems.



An important milestone has also been achieved in our research on photon-phonon interfaces. In particular, we have demonstrated how quantum correlations induced in optomechanical systems allow overcoming the standard quantum limit when measuring displacements and forces. This result is of significant interest for precision sensing and metrology, and further contributes to our understanding of highly coherent photon-phonon interfaces.

### Social and scientific highlight: The Hy-Q retreat

We spent a very enjoyable three days on the Hy-Q retreat in Sobotka, Czech Republic in early autumn 2019. The core of the meeting was in-depth scientific presentations by Hy-Q team members including detailed discussions. The research was further discussed in a very lively poster session. Furthermore, we invited Prof. Wolfgang Tittel from QuTech, Delft, who gave a very inspiring presentation on photonic quantum memories, and we discussed collaborative projects between QuTech and Hy-Q. In group-work sessions, we reflected on how to improve working conditions and create collaborations and synergy between the Hy-Q research groups and beyond. A special session, organized independently by postdocs and PhDs, focused on minorities and the role of gender in quantum physics. Finally, we had a variety of social events including a team-building exercise and a great hike in the nearby national park.

