



# MCQST Colloquium *Special*

Munich Center for Quantum Science and Technology

## Speaker

**Manuel Endres (Caltech)**

„Quantum Science with Tweezer Arrays“

**5 October 2020, 17:15**



**Online Lecture** via Zoom:

**<https://tum-conf.zoom.us/j/93234766313> Passwort: Kolloquium**

## Abstract

Optical tweezer arrays applied to cold neutral atoms have emerged as a versatile platform for quantum science. In particular, atom-by-atom assembly—a feedback-based scheme for entropy removal—now enables the generation of defect-free atomic arrays with flexible geometric arrangements. These assembled atomic arrays form the starting point for experiments in quantum simulation and computing based on excitation to Rydberg states. I will review these developments and describe our very recent results for alkaline-earth atoms. The rich level structure of such two valence-electron atoms enables no-

vel cooling, control, and read-out schemes. We have used these techniques in demonstrations of record imaging and two-qubit entanglement fidelities for neutral atoms. At the same time, this direction naturally merges high-precision spectroscopy with single-atom control within many-atom systems, as exemplified by novel ‘tweezer array clocks’. All in all, tweezer arrays with alkali or alkaline-earth atoms promise a host of high-fidelity applications along almost all axes of quantum science, including simulation, computing, metrology, and communication.

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