Contribution ID: **37** Type: **Poster**

Breaking local symmetries with locality-preserving operations

While in the general framework of quantum resource theories one typically only distinguishes between operations that can or cannot generate the resource of interest, in a many-body setting one can further characterize quantum operations based on underlying geometrical constraints. For instance, a natural question is to understand the power of resource-generating operations that preserve locality and causality. In this work, we address this question within the resource theory of asymmetry, which has recently found applications in the study of symmetry breaking phenomena in many-body physics. We focus on symmetries corresponding to a compact group G with a local action on the space of N qubits, and study the so-called G-asymmetry and its linearized version, ℓ_G. We present two main results. First, we derive a general bound on the asymmetry that can be generated by locality-preserving operations acting on symmetric product states, showing in particular that $\ell_G = O(\sqrt{N})$. Second, we show that locality-preserving operations can generate maximal asymmetry, $\ell_G \sim N$, when applied to symmetric states featuring long-range entanglement. Our results provide a unified perspective on recent studies of asymmetry in many-body physics, highlighting a non-trivial interplay between asymmetry, locality, and entanglement.

Authors: MAZZONI, Michele (University of Bologna); CAPIZZI, Luca (Université Paris-Saclay, CNRS, LPTMS); PIROLI, Lorenzo (University of Bologna)

Presenter: MAZZONI, Michele (University of Bologna)

Session Classification: Poster