SYEC 1: Entanglement and Complexity – How "Complex" is Nature?

Time: Thursday 10:45–12:45 Location: ZHG010

Invited Talk SYEC 1.1 Thu 10:45 ZHG010

Quantum Information and Spacetime: New Ideas and Results — •Michal P. Heller — Department of Physics and Astronomy, Ghent University

In the course of the past two decades, the main driver of progress at the intersection of quantum information and gravity were, first, the notion of entanglement and, later, also complexity. I will discuss new ideas that build on these developments related, on one hand, to the notion of entanglement in time, and, on the other, to the notion of operator growth. Based on 2408.15752, 2412.17785 and work in progress.

Invited Talk SYEC 1.2 Thu 11:15 ZHG010

Entanglement in holography — •Nele Callebaut — University of Cologne, Germany

In this talk I will review how the quantum information theoretic concept of entanglement acquires a geometric interpretation in holographic dualities, and how this insight has led to breakthroughs in both quantum field theory and gravity.

Invited Talk SYEC 1.3 Thu 11:45 ZHG010

The theory of learnability of local Hamiltonians from Gibbs states — •Anurag Anshu — Harvard University, Cambridge, MA

Learning the Hamiltonian underlying a quantum many-body system in thermal equilibrium is a fundamental task in quantum learning theory and experimental sciences. This talk will provide a general overview of the recent learning algorithms for this problem, and highlight how the progress comes hand-in-hand with new insights into the entanglement structure of quantum Gibbs states. We will explore interesting open questions in this direction, in particular the goal of devising algorithms that are easy to implement in experiments.

Invited Talk SYEC 1.4 Thu 12:15 ZHG010

There's a hole in my quantum bucket – complexified quantum theory and its classical limit — •Eva-Maria Graefe — Imperial College London

Traditional quantum mechanics focusses on the description of systems that are closed or well-separated from their environment. Take for example the interior of a bucket. If the bucket is in a good condition its contents will remain inside. However, many physical systems exhibit leakage, such as a loss of a leaking buckets contents to the environment. In quantum mechanics the interior of such an open system can effectively be described by non-Hermitian quantum mechanics, where complex-valued energies encode life-times of states. In this talk, I will provide an overview of non-Hermitian quantum theory, focusing on the aspect of quantum-classical correspondence.