Symposium Entanglement and Complexity – How "Complex" is Nature? (SYEC)

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Entanglement, a key resource in quantum phenomena, was already recognised in the early days of quantum mechanics. In recent decades, the development of quantum information and computing has revealed that carefully engineering quantum dynamics can lead to computational advantages for various classical and quantum problems, as well as secure communication methods. Complexity theory aims to describe and classify different classes of problems based on their "complexity", the resources required to implement the desired task. Surprisingly, these two descriptions reveal a deep connection between how complex and non-classical quantum systems can be. The symposium on entanglement and complexity explores these connections across a wide range of topics. Speakers include M. Heller, who discusses entanglement in quantum field theories; E. Gräfe, exploring entanglement and quantum chaos; N. Callebaut, who delves into entanglement in the AdS/CFT correspondence; and A. Anshu, examining computational complexity and its connection to entanglement. This symposium showcases how these two fields can benefit from mutual exchange.

Overview of Invited Talks and Sessions

(Lecture hall ZHG010)

Invited Talks

SYEC 1.1	Thu	10:45–11:15	ZHG010	**Quantum Information and Spacetime: New Ideas and Results** — •Michal P. Heller
SYEC 1.2	Thu	11:15–11:45	ZHG010	**Entanglement in holography** — •Nele Callebaut
SYEC 1.3	Thu	11:45–12:15	ZHG010	**The theory of learnability of local Hamiltonians from Gibbs states** — •Anurag Anshu
SYEC 1.4	Thu	12:15–12:45	ZHG010	**There's a hole in my quantum bucket – complexified quantum theory and its classical limit** — •Eva-Maria Graefe

Sessions

SYEC 1.1–1.4	Thu	10:45–12:45	ZHG010	**Entanglement and Complexity – How "Complex" is Nature?**