



## 科学前沿报告会 (314)

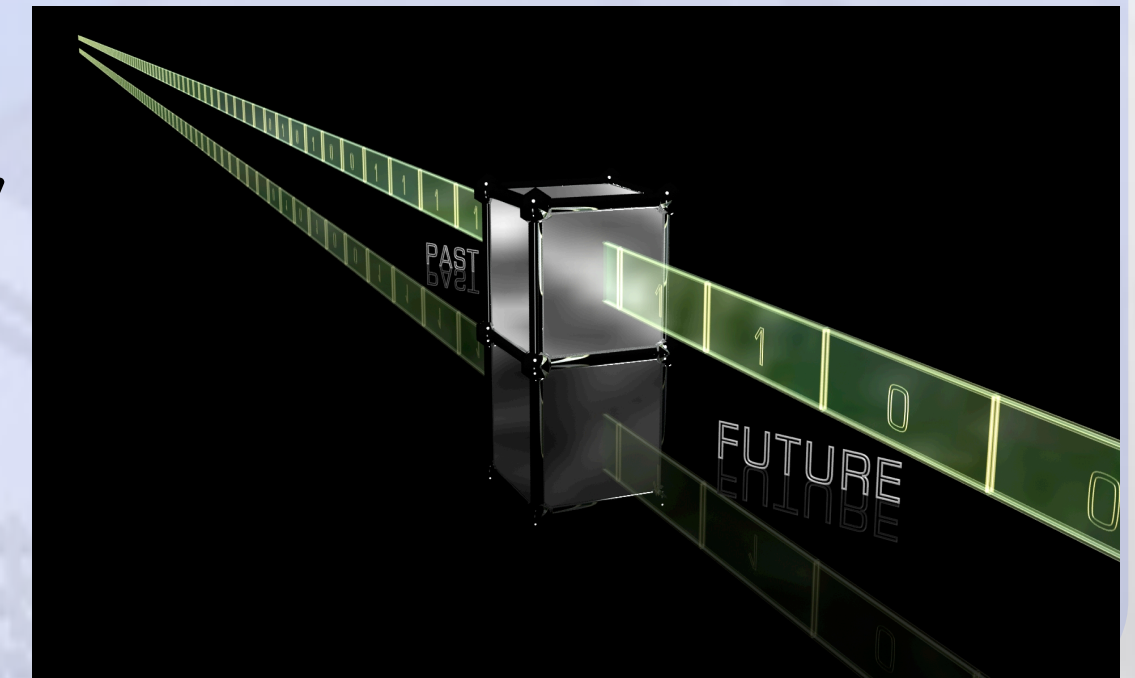
# Quantum Simplicity - How Complex Systems may be Simplified using Quantum Theory

**Prof. Mile Gu**

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**Time: 4:00pm, November 05, 2015 (Thursday)**

**Venue: Room M215, School of Physics, Peking University**



### 报告摘要

We understand complex systems around us through predictive modelling - building algorithms that generate future predictions when given relevant past information. Each model encapsulates a way of understanding future expectations through past observations. In the spirit of Occam's razor, the better we isolate the causes of what we observe, the greater our understanding. This philosophy privileges the simpler models; should two models make identical predictions, the one that requires less input information is preferred. Yet, for almost all stochastic processes, even the provably optimal classical models waste information. The amount of input information they demand exceeds the amount of predictive information they output. This waste creates a significant overhead in memory costs when one seeks to use such models to simulate the world around us - one that becomes increasingly prohibitive as we seek to understand ever more complex systems. In this presentation, I outline how we can systematically construct quantum models that surpass these classical limits, and thus the most efficient simulator of general phenomena is necessarily quantum. I survey the consequences of this to complexity theory, where it suggests that the complexity of natural things ultimately depends on what sort of information processing we have access to.

### 报告人简介

Prof. Mile Gu is assistant professor at Tsinghua University under the China Thousand Talents program, and visiting senior fellow at the Centre for Quantum Technologies. After completing a PhD at the University of Queensland under Michael Nielsen, Gu has made significant contributions to the interface of quantum information, complexity theory and optical quantum computation. His work has been featured in Science and Nature journals on four separate occasions. Gu is also active in the dissemination of science to the general public, and has made guest contributions to New Scientist, Physics Today and the Foundational Questions Institute.