

How Does a Quantum Computer Work?

Speaker: Hans Maassen

When: 16.7.2025, 18:30 - 19:30

Where: Technical University Munich, Theodor-Fischer Lecture Theatre, Room 0360
([on the corner Luisenstraße / Gabelsbergstraße, Entrance: Luisenstraße](#))

About the speaker:

Hans Maassen is a Dutch mathematical physicist and emeritus professor specializing in quantum probability and quantum information theory. Standing out among his discoveries is the entropic uncertainty relations, named after himself and Jos Uffink, a fundamental inequality in quantum mechanics.

Abstract:

Quantum mechanics, now about a century old, is a very successful physical theory of matter on a small scale. From its first description until today, it has surprised scientists and laypersons alike by the strange behaviour it attributes to particles, atoms and molecules. This behaviour can be characterized by the keywords Uncertainty, Superposition, and Entanglement.

It took about sixty years before it was realized that these three characteristics do not just express a certain vagueness and strangeness of matter on a small scale but can actually be used to our advantage. In 1994 Peter Shor made this idea concrete by devising an algorithm that would enable large arrays of quantum systems to perform specific calculations (factoring large integers), which are impossible to do in practice on any classical device. With this algorithm, present-day cryptographic schemes can be broken, provided such "quantum computers" can be made to work.

Starting from a discussion of the "two-slit experiment," we sketch the working of Shor's algorithm and discuss the possibilities of future quantum computers.