



ESI

# Erwin Schrödinger Lecture

Philip Walther / University of Vienna

Photonic quantum computing –  
a bright future for many  
applications

Monday, December 12, 2022, 17:00

Boltzmann Lecture Hall

Erwin Schrödinger Institute



Copyright: Rafaela Proell

**Philip Walther** is a professor at the Faculty of Physics of the University of Vienna. His research interests include photonic quantum computation and quantum simulation, quantum-enhanced cybersecurity, the development of scalable quantum photonic technology, and experimental investigation of the interface between quantum physics and gravity. Prof. Walther is the speaker of the SFB BeyondC and he heads the Christian Doppler Laboratory for Photonic Quantum Computing. In 2021 he received the prestigious Friedrich Wilhelm Bessel Award of the Alexander von Humboldt Stiftung.

## Abstract

The precise quantum control of single photons, together with the intrinsic advantage of being mobile make optical quantum system ideally suited for quantum information applications that require communication or the delegation of tasks. Prominent examples include quantum cryptography as well as quantum clouds and quantum computer networks.

Here I present the current architectures for scalable photonic quantum computers and special purpose applications that exploit advantages of photonic quantum system. This is shown by examples for various quantum computations such as quantum machine learning and in particular reinforcement learning, in addition to secure quantum and classical computing tasks that require quantum networks. As outlook I will discuss technological challenges for the scale up of photonic quantum computers and remarkable opportunities for special-purpose applications such as neuromorphic circuits.

The Erwin Schrödinger Lectures are directed towards a general audience of mathematicians and physicists. In particular it is an intention of these lectures to inform non-specialists and graduate students about recent developments and results in some area of mathematics or physics. The lecture will be followed by a reception.

ESI

Erwin Schrödinger International Institute  
for Mathematics and Physics

[www.esi.ac.at](http://www.esi.ac.at)