



The Vienna Doctoral Programme on Complex Quantum Systems
invites you to a

Seminar Talk

by

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Enhancing microscopy using cavities, Pockels cells, and wave-front shaping

Optical phase contrast microscopy and cryo-electron microscopy are widely used in the study of cells and proteins, respectively. In both techniques, a specimen imparts a phase shift on the probe (photons or electrons), which can be measured using various interferometric techniques.

In this talk I will briefly discuss the physical basics and limits of phase microscopy, and will show ways how to improve on current techniques using wave-front shaping, cavity or quantum enhanced measurements. I will demonstrate how wave-front shaping can enable phase contrast imaging with optimized sensitivity all across the field of view ¹, and how multi-passing the probe particles through a sample can be used for high sensitivity / low damage imaging ². The latter could potentially allow for cryo-electron microscopy with unprecedented resolution ³.

Finally, I will discuss how one of the techniques we developed can be used for gating images on the nanosecond scale, which enables fluorescence lifetime imaging with single molecule sensitivity ⁴.

**Monday, 18 November 2019,
16:30h get-together with coffee and snacks!**

Lise Meitner Hörsaal, Strudlhofgasse 4, 1st floor, Vienna

The seminar talk will be preceded by a CoQuS Student talk at 17:00h

by

Andrew Niels Kanagin

TU Wien

Spin Ensembles in Cryogenic Crystals

Hosted by: Philip Walther

1. Juffmann, T., de los Ríos Sommer, A. & Gigan, S. Local Optimization of Wave-fronts for optimal sensitivity PHase Imaging (LowPhi). *Opt. Commun.* **454**, 124484 (2020).
2. Juffmann, T., Klopfer, B. B., Frankort, T. L. I. I., Haslinger, P. & Kasevich, M. A. Multi-pass microscopy. *Nat. Commun.* **7**, 12858 (2016).
3. Juffmann, T. *et al.* Multi-pass transmission electron microscopy. *Sci. Rep.* **7**, 1699 (2017).
4. Bowman, A. J., Klopfer, B. B., Juffmann, T. & Kasevich, M. A. Electro-optic imaging enables efficient wide-field fluorescence lifetime microscopy. *Nat. Commun.* **10**, 4561 (2019).