Lars Kürten

PhD Student
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Introduction

I am a PhD student at the Gulliver Lab (ESPCI Paris), supervised by C. P. Royall, working on colloidal model systems. I have a strong interest in statistical physics, phase behaviour, and the underlying mechanisms of crystallization and self-assembly. My research focuses on hard spheres in and out of equilibrium, crystallization of dipolar particles, and the self-assembly of active colloids. I am trained in laser scanning and spinning disk confocal microscopy, colloidal sample preparation and handling, computer simulations, real-space structural analysis using conventional algorithms and deep learning methods for data analysis in Python.

Education

PhD, Physics — Oct 2022 -
Gulliver Lab, ESPCI Paris PSL, CNRS
Thesis: Direct Visualisation of Nucleation: From Fundamentals to new Materials
Supervisor: C. P. Royall

Master of Science, Medical Physics — Aug 2019 - Feb 2022
Heinrich-Heine-Universität Düsseldorf
Thesis: Mobility and Organization in Colloidal Trimer-Monomer Mixtures
Supervisor: Prof. Dr. S. U. Egelhaaf

Bachelor of Science, Medical Physics — Oct 2015 - Aug 2019
Heinrich-Heine-Universität Düsseldorf
Thesis: Laplace Deep Level Transient Spectroscopy on self-assembled quantum dots

German Abitur, final grade: 1.6 — Jun 2015
Maria-Wächtler Gymnasium, Essen
advanced level class: Mathematics, Biology

Publications

A. Kawafi, L. Kürten, L. Ortlieb, Y. Yang, A. Mauleon Amieva, J. E. Hallett, C. P. Royall, *Colloidoscope: Detecting Dense Colloids in 3d with Deep Learning*, Soft Matter (DOI: 10.1039/D4SM01307G), May 2025

L. Kürten, A. Castagnède, F. Smallenburg, C. P. Royall, *The Free-Energy Barrier of Precritical Nuclei in Hard Spheres is Consistent with Predictions*, arXiv:2503.17270v4, April 2025

L. Schnorr, J. Labes, L. Kürten, T. Heinzel, C. Rothfuchs-Engels, S. Scholz, A. Ludwig, and A. D. Wieck, *Electron capture and emission dynamics of self-assembled quantum dots far from equilibrium with the environment*, Phys. Rev. B 104, July 2021

Scientific Talks

Crystallization and Self-Assembly: from Soft Matter to Pharmaceuticals to Biomineralisation (contributed talk) — Roscoff, May 2025
Liquid Matter Conference (contributed talk) — Mainz, September 2024
The triple point of failure in glasses and gels (contributed talk) — Paris, July 2024
European Student Colloid Conference (contributed talk) — Bordeaux, July 2024
Soft Matter Seminar at Heinrich-Heine-Universität — Düsseldorf, April 2024
PSL Soft and Living Matter Days (contributed talk) — Paris, July 2023

Scientific Posters

Advanced School of Liquids and Complex Fluids (1st Prize) — London, June 2024

Work Experience

Working Student – Engineering and Development, — Jan 2018 - Jun 2023
Development of measuring stands and evaluation of long-term tests for quality control.
Schwarzer Precision, Essen

Voluntary Work

Volunteer Tutor — Oct 2020 - Jul 2021
Tutoring of underprivileged students in mathematics and prepared them for the Abitur.
Gesamtschule Bockmühle, Essen

Skills

Experimental Techniques:

- Confocal microscopy (laser scanning and spinning disk)
- Colloidal sample preparation and handling

Computational Techniques and Data Analysis:

- Deep learning for image analysis and particle tracking
- Python (NumPy, SciPy, matplotlib, pandas, scikit-image, PyTorch/TensorFlow)
- MATLAB
- Computer Simulations (e.g., Molecular dynamics, Monte Carlo)

Languages:

- German: Native Speaker
- English: Fluent
- French / Spanish: Basic knowledge

Hobbies & Interests

Sports: Handball (20 years of active experience)
Music
Cooking