

SEBASTIAN BAUER

PhD Student in Bioinformatics, Stockholm University & SciLifeLab

Guest Researcher, AITHYRA, Vienna

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I develop machine-learning methods for light microscopy that build in inductive biases from geometry, structure and physics, with a focus on generative models (flow matching, graph neural networks) for single-molecule localization microscopy.

EDUCATION

PhD in Bioinformatics

Nov 2023 – present (exp. Mar 2028)

Stockholm University & SciLifeLab

Stockholm, Sweden

Advisor: Prof. Juliette Griffié. Inductive biases from geometry, structure and physics for machine-learning-based analysis of light microscopy; generative models for single-molecule localization microscopy (SMLM).

MSc in Engineering Physics, specialisation Biomedical Physics

Aug 2021 – Jun 2023

KTH Royal Institute of Technology

Stockholm, Sweden

Thesis: *Co-evolutional analysis of the Na^+, K^+ -ATPase's β -subunit dimerization*. Advisors: Prof. Lucie Delemotte, Prof. Hjalmar Brismar.

Erasmus exchange year

Aug 2020 – Jun 2021

KTH Royal Institute of Technology

Stockholm, Sweden

BSc in Technical Physics

Oct 2017 – Jul 2020

TU Wien

Vienna, Austria

Thesis in quantum optics: *The difference in maximum power between pulsed and cw LED operation*. Advisor: Prof. Philipp Haslinger, Institute of Atomic and Subatomic Physics.

RESEARCH EXPERIENCE

Guest Researcher

Sep 2026 – present

AITHYRA, Tong Group

Vienna, Austria

Improving generative models for single-molecule localization microscopy.

Research Assistant

Feb 2022 – Jul 2023

SciLifeLab & KTH, Brismar Lab

Stockholm, Sweden

Developed microscopy methods for imaging the Na^+, K^+ -ATPase: expansion microscopy, STED microscopy and click chemistry, alongside work on cell synchronization and mitochondrial dynamics. Cell culture, sample preparation and labelling, confocal, light-sheet and STED microscopy.

Summer Intern

Jul 2019

Nuclear Engineering Seibersdorf

Seibersdorf, Austria

Measurements on radioactive samples.

Summer Intern

Jul 2018

RUAG Space

Vienna, Austria

Material tests and predictive modelling of the thermal insulation of rocket boosters.

PUBLICATIONS

Full list on [Google Scholar](#).

Journal articles

[J1] S. Edwards, B. Meineke, **S. Bauer**, H. Blom, S. Elsässer, H. Brismar. *Dual-color expansion microscopy of membrane proteins using bioorthogonal labeling*. *Nano Letters* 26(4), 1321–1326, 2026. [doi:10.1021/acs.nanolett.5c05301](https://doi.org/10.1021/acs.nanolett.5c05301)

[J2] I. Cunha, E. Latron, **S. Bauer**, D. Sage, J. Griffié. *Machine learning in microscopy – insights, opportunities and challenges*. *Journal of Cell Science* 137(20), jcs262095, 2024. [doi:10.1242/jcs.262095](https://doi.org/10.1242/jcs.262095)

Preprints

[P1] **S. Bauer**, L. Panconi, I. Cunha, E. Latron, D. Sage, R. Peters, J. Griffié. *SMLMFlow: Improving structural resolution in single molecule localization microscopy with flow matching*. *bioRxiv*, 2026. [doi:10.64898/2026.06.11.731424](https://doi.org/10.64898/2026.06.11.731424)

- [P2] I. Cunha, L. Panconi, **S. Bauer**, M. Gestin, E. Latron, E. Sahai, A. Le Marois, J. Griffié. *AI4CellFate: Interpretable early cell fate prediction with generative AI*. bioRxiv, 2025. doi:10.1101/2025.05.12.653464
- [P3] O. Sarigöz, V. D. Valeriano, U. Avican, H. Wang, K. Nilsson, N. Hasanzade, F. Mahmood, A. Fahlgren, **S. Bauer**, J. Griffié, M. Fällman, K. Avican. *6S RNA facilitates bacterial virulence and adaptation at the epithelial barrier*. bioRxiv, 2025. doi:10.1101/2025.10.07.681022

Conference abstracts

- [C1] S. Edwards, **S. Bauer**, P. Graef, B. Meineke, S. Elsässer, H. Brismar. *Expansion microscopy and bioorthogonal labeling with non-canonical amino acids enables cluster analysis of Na,K-ATPase in the plasma membrane*. Physiology 38(S1), 5732753, 2023. doi:10.1152/physiol.2023.38.S1.5732753
- [C2] H. Brismar, S. Edwards, **S. Bauer**, B. Meineke, S. Elsässer, S. Wennmalm. *Click chemistry, FRET-FCS, and expansion microscopy reveal that Na,K-ATPase forms complexes in the plasma membrane*. Physiology 38(S1), 5732603, 2023. doi:10.1152/physiol.2023.38.S1.5732603

TALKS, POSTERS & AWARDS

- 2026 SMLMS 2026, 15th Single Molecule Localization Microscopy Symposium, Stockholm. Invited talk: *Beyond localization*.
- 2025 SMLMS 2025, Single Molecule Localization Microscopy Symposium, Bonn. Selected talk: *SMLMFlow: Improving structural resolution in SMLM with flow matching and GNNs*.
- 2025 Workshop of the 2nd Anomalous Diffusion (AnDi) Challenge, Gothenburg. Invited talk: *SMLMFlow*. **Best Poster Prize**.
- 2025 LOGML 2025, London Geometry and Machine Learning Summer School, Imperial College London. Poster: *SMLMFlow*.
- 2016 Hans Riegel-Fachpreis in physics, region Vienna. **1st place**, for the high-school thesis on aerodynamics in road cycling.

TEACHING & SUPERVISION

Teaching

- 2024– Introduction to data analysis for life scientists.
- 2024 Bioinformatics.

Thesis supervision

- 2026 Meike Knull, Master's thesis: *Context aware inpainting for single molecule localization microscopy*.
- 2025 Erik Blondell, Master's thesis: *Quantifying cellular structures at the nanoscale with graph neural networks*.

SERVICE

- 2026 SMLMS 2026, 15th Single Molecule Localization Microscopy Symposium, Stockholm. Local coordinator.
- 2026 Protein Folding Conference, Stockholm. Local organising team.
- 2016–17 Civilian service: teaching assistant, Karl Schubert Schule (school for children with special needs), Vienna.

EXTRACURRICULAR ACTIVITIES

- 2021–23 Swim coach and board member, KTH Simförening, Stockholm. Coached the club's swimmers and organised its weekly training.
- 2016–22 Competitive triathlete. National and international races.
- 2017–20 Mathematics tutor, Vienna. Private tutoring for high-school students.

SKILLS & INTERESTS

Research	Single-molecule localization microscopy, generative models, flow matching, graph neural networks
Computing	Python, machine learning
Laboratory	Fluorescence microscopy (confocal, light-sheet, STED, expansion microscopy), cell culture, sample preparation and labelling
Languages	German (native), English (fluent), Swedish (intermediate)
Interests	Endurance sports, cooking, travelling