CV – Sarah A. M. Loos

Max Planck Institute
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Email:sarah.loos@ds.mpg.de
Born 1991 in Saarbrücken, GER

October 2025

Professional Experience

Since August 2025: **Max Planck Research Group Leader (W2)** in Lise-Meitner Excellence Programme, head of group on *Statistical Physics Beyond Equilibrium* at the Max Planck Institute for Dynamics and Self-Organization, Goettingen, Germany

June 2022 — Aug 2025: Independent Postdoctoral Fellow at the **Department of Applied Mathematics and Theoretical Physics (DAMTP), University of Cambridge**, UK, in the Soft Matter group led by **Michael E. Cates**

Oct. 2023 — Aug 2025: Research Fellow at **Corpus Christi College Cambridge**, UK

April 2021 – May 2022: Postdoctoral Researcher at **ICTP, Trieste**, IT, in the group of Édgar Roldán

Aug 2020 – Mar 2021: Postdoctoral Researcher at **Leipzig University**, GER, in the group of Klaus Kroy

Mar 2020 – Aug 2020: Postdoctoral Researcher at **Technical University of Berlin (TU Berlin)**, GER

Oct 2015 – Mar 2020: Doctorate at **TU Berlin**, GER, in the group of Sabine H.L. Klapp

Oct 2013 – Mar 2014: 6-month research internship at **Duke University**, NC, US, in the group of Joshua Socolar

Education

2020: Dr. Rer. Nat. at TU Berlin, Grade: **Summa cum laude ("with highest honours")**
Thesis on *Stochastic systems with time delay: probabilistic and thermodynamic descriptions of non-Markovian processes far from equilibrium* (Defence/Viva: 13 March 2020), supervised by Sabine H.L. Klapp

2015: Master (M.Sc.) in Physics at TU Berlin, **Final grade: 1.0 (Best achievable grade*)**
Thesis supervised by A. Zakharova and E. Schöll, Grade 1.0

2013: Bachelor (B.Sc.) in Physics at TU Berlin, **Final grade 1.1**
Thesis supervised by S. Klapp, Grade 1.0

2009: Highschool graduation (Abitur) in Saarbrücken, GER, **Final grade 1.0 (Best achievable grade*)**

2007: Junior student in Mechatronics at UdS ("Program for outstanding pupils" / "Begabtenförderung")

*German grading scale: **1.0 – 1.5 very good (A)**, 1.6 – 2.5 good (B), 2.6 – 3.5 satisfactory (C), 3.6 – 4.0 sufficient (D), 4.1 – 6.0 insufficient (F)

Distinctions and Awards

2024: **Early Career Award** by the **Statistical Mechanics and Thermodynamics Group of the Royal Society of Chemistry** (endowed with 500 GBP), https://www.rsc.org/

2023: **Peter-Debye Lecture** at Leipzig University, https://www.physes.uni-leipzig.de/

2023: **SigmaPhi Prize for Best Oral presentation for Early Career Scientists** with title: *Stochastic thermodynamics of a particle in a correlated field* (endowed with 500 EUR)

2021: German-wide **SKM Dissertation Prize 2021** of the German Physical Society (DPG), Condensed Matter Section (SKM), endowed with 1500 EUR

2020: **Springer Thesis Award for Dissertation** by Springer Nature (endowed with 500 EUR)

2020: **Carl-Ramsauer Preis** of the DPG in Berlin for Dissertation (endowed with 1500 EUR)

2019: **Europhysics Letters – EPL poster prize** (first place) shared with S. Hermann, at the EPS Meeting on Statistical Physics of Complex Systems, Stockholm (endowed with 200 EUR)

2016: **Physik-Studienpreis of the DPG Berlin** "for excellent Master thesis", (endowed with 1000 EUR)

2009: Awards for highschool graduation on "Best overall grade" and "Best grade in physics" by **DPG**

Grants and Fellowships

2025: Invitation to program *New Trends in Non-equilibrium Dynamics* at **Kavli-Institute of Theoretical Physics (KITP), Santa Barbara**, US

2024: Invitation to program *Active Solids: From Metamaterials to Biological Tissue* at **Kavli-Institute of Theoretical Physics (KITP), Santa Barbara**, US, Oct - Dec 2024

2023: Research Fellowship (NSRF) at **Corpus Christi College**, Cambridge, UK

2022: **Marie Skłodowska-Curie Actions (MSCA) Postdoctoral Fellowship**
endowed with > 220.900 EUR, originally by the European Commission, undertaken by **UKRI** due to Brexit

2022: **Postdoctoral Walter Benjamin Fellowship by DFG** (German Research Foundation), endowed with >74.000 EUR (June 2022 – Aug 2023)

2022: Funding from **ICTP for Conference** on *Non-Markovian dynamics far from equilibrium,* together with B. Walter (SISSA), E. Roldan (ICTP), and A. Gambassi (SISSA)

2022: Funding from **Joachim-Herz Stiftung** for Workshop on *Adaptivity in nonlinear dynamical systems*, together with R. Berner (HU Berlin) and J. Sawicki (PIK)

2013-2015: Scholarship of the **Studienstiftung des Deutschen Volkes**

2013: **TASSEP Program** of TU Berlin for 6-month research stay at Duke University, North Carolina, US

Invited Conference Talks

Upcoming: LIV Winter Meeting on Statistical Physics, January 2026, Monterrey, Mexico, Plenary talk

Upcoming: Kyoto Workshop on Quantum Thermodynamics and Stochastic Thermodynamics 2025, Dec, Japan

Upcoming: Erice conference: Artificial and Intelligent Living Matter II, Erice, Italy, March 2026

Upcoming: Navigating the Frontier of Non-Equilibrium Systems and Collective Phenomena, Oct. 2025, Germany

Sept. 2025: Conference on Self-Organizing and Evolving Active Matter, MPI-PKS, Dresden, Invited talk

Sept. 2025: MMSD Meeting on Life-like and living matter in Mainz, GER, and Chicago, US, Invited talk

July 2025: **STATPHYS29** Satellite meeting on Active Matter, Leiden, NL, Invited talk

June 2025: **IntCha25** – Conference on Interdisciplinary challenges in non-equilibrium physics, EMBL Heidelberg, GER, Invited talk

May 2025: **WOST VI** — Workshop on Stochastic Thermodynamics, online event, Invited talk

May 2025: Workshop on Non-reciprocity Across Scales, Amsterdam, NL, Invited talk

May 2025: Workshop on Conservation Laws and Non-Reciprocity (May 2025), Münster, GER, Invited talk

April 2025: Conference on Statistical Physics of Active Matter (April 2025), Paris, FRA, Invited talk

April 2025: Conference on Non-equilibrium thermodynamics: from chemical reactions to machine learning, Edinburgh, UK, Invited talk

March 2025: **DPG Frühjahrstagung der SKM**, Regensburg, GER, Invited talk

Oct. 2024: **KITP** conference on Many faces of active mechanics, Santa Barbara, US, Invited talk

Aug. 2024: Invited talk at **Dynamics Days Europe**, Bremen, GER, Invited talk

June 2024: Workshop on Out of equilibrium nanothermodynamics with levitated particles, Université Paris Saclay, FRA, Invited tutorial

June 2024: Workshop on Dissipative Processes in Molecular Systems, U Padova, IT, Invited talk

June 2024: CSH Workshop on Stat. Mech. Approaches of Complex Systems, Vienna, AT, Invited talk

April 2024: **ESI** Workshop on Transport properties in Soft Matter Systems, Vienna, AT, Invited talk

March 2024: **DPG Frühjahrstagung der SKM,** Berlin, GER, Invited symposium talk

Nov. 2023: 5th Nottingham Workshop on Quantum Non-Equilibrium Dynamics, UK, invited talk

Sept. 2023: **CMD30-FisMat2023** conference by the EPS Condensed Matter Division and the Italian community of condensed matter physics, optics, liquids and soft matter, Milano, IT, invited talk

July 2023: **SigmaPhi Europhysics Conference**, Chania-Crete, GRC, invited talk

June 2023: **IOP Theory of Condensed Matter Group Meeting 2023**, U Warwick, UK, Invited talk

March 2023: LMS Workshop on the Mathematics of Delayed Phenomena – Theory, Numerics and Applications**,** at Northumbria University, Newcastle upon Tyne, UK, Invited talk

Dec. 2022: Conference on Quantum Non-Markovianity, Newcastle, AUS, Invited talk

Nov. 2022: SFB910 Conference on Control of Self-Organizing Nonlinear Systems, Potsdam, GER, Invited

May 2022: **WOST III** — Workshop on Stochastic Thermodynamics, virtual meeting, Invited talk

March 2022: **APS March Meeting**, in Chicago, US, Invited talk

Sept. 2021: **DPG Frühjahrstagung der SKM** (virtual meeting), GER, Invited talk

Invited Seminars and Colloquia

June 2025: LLN Seminar on Condensed Matter Theory, by the Universities of Nottingham, Leeds, and Loughborough, UK

April 2025: Seminar at **MPI-PKS,** Dresden, GER

Feb. 2025: Theoretical Physics Seminar at the **University of Bristol**, UK

Feb. 2025: BioSoft Theory seminar at **University of Oxford**, UK

Jan. 2025: **Gulliver seminar,** at the **ESPCI, Paris**, FRA

Dec. 2024: Seminar at **University of Berkley,** Redwood Center, Berkley, US

Nov. 2024: Biophysics Seminar at **Massachusetts Institute of Technology (MIT)**, Cambridge, US

July 2024: Seminar at IQOQI, Faculty of Physics at the **University of Vienna**, Vienna, AT

June 2024: Seminar at **MPI for Dynamics and Self-organisation**, Goettingen, GER

June 2024: ICTP/SISSA Statistical Physics Seminar, **SISSA**, Trieste, IT

Feb. 2024: Mathematical Physics seminar series at **Imperial College London**, UK

Jan 2024: Seminar of SFB 1238 at **Universität Köln**, GER

Dec. 2023: Seminar at **LOMA, CNRS, Bordeaux**, FRA

Dec. 2023: Seminar of SFB 1027 at **Universität des Saarlandes,** GER

Nov. 2023: Seminar at **Queen Mary University London,** UK

Oct. 2023: Peter-Debye lecture at the **Leipzig University**, GER

June 2023: Theoretisch Physikalisches Kolloquium at **University of Kaiserslautern-Landau**, GER

Feb. 2023: Seminar of the Statistical Physics Group at **Coventry University**, UK

Jan. 2023: Colloquium talk at **Universität Konstanz**, GER

Nov. 2022: Seminar of Disordered Systems Group, **King's College London**, UK

Oct. 2022: Seminar in **Edinburgh Statistical Physics and Complexity group**, UK

June 2022: Seminar at **IFISC, Palma de Mallorca**, ESP

May 2022: Seminar at **University of Padova**, IT

April 2022: Seminar at **Queen Mary University London**, UK

March 2022: CSCS Seminar at the **University of Michigan**, US

Jan. 2022: CeNos Colloquium at **Universität Münster,** GER

Oct. 2021: Soft Matter Seminar at **University of Cambridge** at DAMTP, UK

Dec. 2020: Seminar of AG Höfling at **Freie Universität Berlin**, GER

July 2019: Seminar of the Department of Quantitative Life Science at **ICTP**, Trieste, IT

June 2019: Seminar of the AG Netz at **Freie Universität Berlin**, GER

May 2019: Seminar of AG Kroy at **Universität Leipzig**, GER

Feb. 2019: Seminar of AG Kuehn at **Technische Universität München**, GER

Nov. 2018: Seminar of AG Ihle at **Universität Greifswald**, GER

June 2018: Seminar of AG Fieldler at **Freie Universität Berlin**, GER

June 2017: Seminar of AG Fiedler at **Freie Universität Berlin**, GER

Teaching, Supervision and Examining

Teaching

Teaching a course on *Fundamentals of Statistical Mechanics* at ICTP, including the preparation, supervision, and grading of the exam (winter term 2021)

Teaching a seminar on *Active Matter* at Leipzig University (winter semester 2020/21)

Tutor for *Mathematical methods for physicists* at TU Berlin (summer semester 2012)

Supervision

Supervision of Doctorate by Lars Stutzer at MPI-DS, GER (since 2025)

Co-supervision of Doctorate by Thomas Suchanek at Leipzig University, GER (since 2023)

Supervision of Part III Physics project of Noah Grodzinski at U Cambridge, UK (Oct 2023 – May 2024)

Supervision of Diploma Project by Kristian Pajanonot at ICTP, IT (2022)

Supervision of Master Thesis by Thomas Suchanek, at Leipzig University, GER (2021 – 2022)

Supervision of Master Thesis by Timo Doerries at TU Berlin, GER (2019 – 2021)

Supervision of Bachelor Thesis by Jan Meyer at TU Berlin, GER (2017)

Examining

2025: Committee member of **Doctoral Disputation** at **MPI-DS,** GER, by Lukas Hupe on "Effective descriptions of growth-induced collective behaviour in different active systems", Advisor: Bittihn, Philip

2024: Examiner for **Doctoral thesis** at **Université Paris Cité,** FRA, by Paul Raux on "Circuit theory for thermodynamic devices in stationary nonequilibrium", Advisors: Christophe Goupil, Gatien Verley

2024: Examiner for **Bachelor thesis** at **Leipzig University,** GER, by Paul John on "Influence of locomotion on population dynamics", Advisor: Klaus Kroy

2024: Examiner for **Part III Physics Thesis** at the **University of Cambridge,** UK, by Noah Grodzinski, Title of Thesis: "A Non-Reciprocal XY Model with Quenched Disorder"

2023: Examiner for **Doctoral thesis** at **University of Oxford,** UK, by Mr Jonathan Utterson (Doctor of Philosophy) on "An Investigation of Molecular Dynamics for Simple Liquids"**,** Supervisor: R Erban

2022: Examiner for **Diploma thesis** at **ICTP,** Trieste, IT, by Kristian Pajanonot on "Fluctuations and Response in Non-reciprocal Biophysical Models"

2022: Examiner for **Master thesis** at **Leipzig University,** GER, by Thomas Suchanek on "Steady-state entropy production in dynamical field theories with non-reciprocal coupling"

Organization of Scientific Events

April 2023 - May 2025: Organization of the **DAMTP Statistical Physics and Soft Matter Seminar**, at the Centre for Mathematical Sciences, University of Cambridge, UK

Sept. 2025: Workshop on Nonequilibrium Systems Under Control, at the **Lorentz center**, Leiden, NL, Scientific organizers: Etienne Fodor, Todd Gingrich, and SAML

July 2024: Workshop on Out-of-Equilibrium Phenomena in the Presence of Curvature and Non-Reciprocal Interactions, at **CECAM** in Lausanne, CHE, Scientific organizers: Demian Levis, Rastko Sknepnek, Daniel Pierce, Daniel Matoz-Fernandez, and SAML

Nov. 2023: Workshop on Modelling non-Markovian movement at **Isaac Newton Institute, University of Cambridge,** UK, Scientific organizers: Guillermo Abramson, Tomas Alarcon, and SAML

Sept. 2022: Workshop on Adaptivity in nonlinear dynamical systems, funded by Joachim Herz Stiftung and hosted at **PIK** (Potsdam, GER) as hybrid meeting. Scientific organizers: Rico Berner, Jakub Sawicki, and SAML

May 2022: **ICTP and SISSA** Conference on Non-Markovian dynamics far from equilibrium, Trieste, hosted by ICTP, IT, as hybrid meeting. Scientific organizers: Benjamin Walter, Édgar Roldán, Andrea Gambassi, SAML

Nov. 2019: Session on *Nonequilibrium Processes in different fields: from extreme weather events to black holes* at Conference of Women in Physics, TU Berlin, GER

May 2019: Symposium on *Embedding strategies for delay problems in different fields*, TU Berlin, GER

Public Outreach and Engagement

Nov. 2022-Sept 2024: Mentor for math students in *Women and non-binary mentorship scheme,* CMS, U Cambridge

Nov. 2023: Panellist in EDI session on *Gender Equality in Science* at INI, U Cambridge

Nov. 2019: Speaker at German Conference for Women in Physics, TU Berlin

June 2019: Speaker at Soapbox Event Berlin, Alexanderplatz, GER (Talk: *Entropy and the arrow of time*)

May 2019: Speaker at Perspectivencafé (Mentoring of high school students), TU Berlin

May 2018: Speaker at Perspectivencafé (Mentoring of high school students), TU Berlin

Nov. 2016: Speaker at German Conference for Women in Physics, DESY Hamburg, GER

Refereeing and Editorial Activities

Since May 2024: **Member of Editorial Board of IOP Journal of Physics A: Mathematical and Theoretical**

2022 - 2024: Guest Editor for IOP Journal of Physics A: Mathematical and Theoretical,
Special Issue on *Non-Markovian Effects in Nonequilibrium Systems*, together with Aljaz Godec

Refereeing Activities for *Physical Review Letter, Physical Review Research, Physical Review E, J. Phys. A, J. Stat. Phys., J. Stat. Mech., Physica A, Physics Letters A, EPL, Nature Nanotechnology, Nature Comm., Nature Physics, Entropy, etc.*

Publication List – Sarah A. M. Loos

H-index 17, > 1000 citations (Oct. 2025, google scholar)

Preprints

1. T. Hempel and S. A.M. Loos
   Reconstruction method to infer nonreciprocal interactions and local driving in complex systems
   ArXiv:2403.09243 (2024)

Journal Articles

2. S. Monter, S. A.M. Loos, and C. Bechinger
   Optimal transitions between nonequilibrium steady states
   Proceedings of the National Academy of Sciences, 122, e2510654122 (2025)

3. R. Garcia-Millan*, J. Schüttler*, M. E. Cates, S. A.M. Loos
   Optimal closed-loop control of active particles and a minimal information engine
   Physical Review Letters 135, 088301 (2025)

4. J. Schüttler, R. Garcia-Millan, M. E. Cates, S. A.M. Loos
   Active particles in moving traps: minimum work protocols and information efficiency of work extraction
   Phys. Rev. E 112, 024119 (2025)

5. G. Bandini, D. Venturelli, S. A.M. Loos, A. Jelic, A. Gambassi,
   The XY model with vision cone: non-reciprocal vs. reciprocal interactions
   J. Stat. Mech. 053205 (2025)

6. S. A.M. Loos, S. Monter, F. Ginot, and C. Bechinger
   Universal symmetry of optimal control at the microscale
   Physical Review X 14, 021032 (2024)
   (Highlighted in **APS Physics** article "Time-Symmetric Motion Maximizes Energy Efficiency in Fluid," 2024)

7. D. Venturelli*, S. A.M. Loos*, B. Walter*, É. Roldán, and A. Gambassi (**shared first authorship*)
   Stochastic Thermodynamics of a Probe in a Fluctuating Correlated Field
   EPL 146, 27001 (2024)

8. A. Seif, S. A.M. Loos, G. Tucci, É. Roldán, and S. Goldt
   The impact of memory on learning sequence-to-sequence tasks
   Machine Learning- Science and Technology **5,** 015053 (2024)

9. T. Suchanek, K. Kroy, and S. A.M. Loos
   Irreversible mesoscale fluctuations herald the emergence of dynamical phases
   Physical Review Letters 131, 258302 (2023)

10. T. Suchanek, K. Kroy, and S. A.M. Loos
Time-reversal and PT symmetry breaking in non-Hermitian field theories
Physical Review E **108**, 064123 (2023)

11. T. Suchanek, K. Kroy, and S. A.M. Loos
Entropy production in the nonreciprocal Cahn-Hilliard model
Physical Review E **108**, 064610 (2023)

12. J. Sawicki*, R. Berner*, S. A.M. Loos,* et al. (**shared first authorship)*
Perspectives on adaptive dynamical systems
Chaos: An Interdisciplinary Journal of Nonlinear Science **33**, 071501 (2023)
(Highlighted in AIP Scilight article "A look at adaptive systems from biology to machine learning")

13. S. A.M. Loos, S. H. L. Klapp, and T. Martynec
Long-range Order and Directional Defect Propagation in the Nonreciprocal XY Model with Vision Cone Interactions
Physical Review Letters 130, 198301 (2023)

14. S. A.M. Loos, S. Arabha, A. Rajabpour, A. Hassanali, and É. Roldán
Nonreciprocal nanoparticle refrigerators: design principles and constraints
Scientific Reports **13**, 4517 (2023)

15. V. Holubec, A. Ryabov, S. A.M. Loos, and K. Kroy
Equilibrium Stochastic Delay Processes
New Journal of Physics **24**, 023021 (2022)

16. V. Holubec, D. Geiss, S. A.M. Loos, K. Kroy, and F. Cichos
Finite-size scaling at the edge of disorder in a time-delay Vicsek model
Physical Review Letters 127, 258001 (2021)

17. S. A.M. Loos and S. H.L. Klapp *(Editor's Choice Article)*
Medium Entropy Reduction and Instability in Stochastic Systems with Distributed Delay
Entropy **23**, 696 (2021)

18. T. J. Doerries, S. A.M. Loos, and S. H.L. Klapp
Correlation functions of non-Markovian systems out of equilibrium: Analytical expressions beyond single-exponential memory
J. Stat. Mech.: Theory and Experiment **2021**, 033202 (2021)

19. S. A.M. Loos and S. H.L. Klapp (*>100 citations, google scholar*)
Irreversibility, heat and information flows induced by non-reciprocal interactions
New Journal of Physics **22**, 123051 (2020)

20. T. Martynec, S. H.L. Klapp, and S. A.M. Loos
Entropy production at criticality in a non-equilibrium Potts model
New Journal of Physics **22**, 093069 (2020)

21. S. A.M. Loos and S. H.L. Klapp
Fokker-Planck equations for time-delayed systems via Markovian Embedding
Journal of Statistical Physics **177**, 95-118 (2019)

22. S. A.M. Loos and S. H.L. Klapp
Heat flow due to time-delayed feedback
Scientific Reports **9**, 2491 (2019)

23. S. A.M. Loos and S. H.L. Klapp
Force-linearization closure for non-Markovian Langevin systems with time delay
Physical Review E **96**, 012106 (2017)

24. S. A.M. Loos, J. C. Claussen, E. Schöll, and A. Zakharova (>100 citations, google scholar)
Chimera patterns under the impact of noise
Physical Review E **93**, 012209 (2016)

25. I. Schneider, M. Kapeller, S. Loos, A. Zakharova, B. Fiedler, and E. Schöll
Stable and transient multicluster oscillation death in nonlocally coupled networks
Physical Review E **92**, 052915 (2015)

26. S. A.M. Loos, R. Gernert, and S. H. L. Klapp
Delay-induced transport in a rocking ratchet under feedback control
Physical Review E **89**, 052136 (2014)

News & Viewpoint Articles

1. S. A.M. Loos
Smooth Control of Active Matter
APS Physics **17**, 20 (2023)

2. S. A.M. Loos
Measurement of scale-dependent time-reversal asymmetry in biological systems
Nature Nanotechnology (2023)

Peer-Reviewed Conference Proceedings

3. S. Loos, A. Zakharova, J. C. Claussen, and E. Schöll
Robustness of chimera states with respect to noise, in Proceedings of the 7th International Conference on Physics and Control, Istanbul (PhysCon 2015)

4. A. Zakharova, S. Loos, J. Siebert, A. Gjurchinovski, and E. Schöll
Chimera patterns: influence of time delay and noise, IFAC-PapersOnLine **48,** 007 (2015)

Book Chapters

5. R. Gernert, S. A.M. Loos, K. Lichtner, and S. H. L. Klapp, Feedback control of colloidal transport, in Control of Self-Organizing Nonlinear Systems, ed. by Schöll, Klapp, Hövel (Springer, 2016)

6. A. Zakharova, S. A.M. Loos, J. Siebert, A. Gjurchinovski, J. C. Claussen, and E. Schöll
Controlling chimera patterns in networks: interplay of structure, noise, and delay
in Control of Self-Organizing Nonlinear Systems, ed. by Schöll, Klapp, Hövel (Springer, 2016)