Charlotte Petersen

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Employment

November 2022 – Present
University of Melbourne, School of Chemistry
Lecturer and ARC DECRA Fellow

December 2021 – November 2022
University of Sydney, School of Chemistry
ARC DECRA Fellow

November 2020 – December 2021
University of Queensland, Australian Institute for Bioengineering and Nanotechnology
Research Fellow in the Theoretical and Computational Molecular Science group of Prof. Debra Bernhardt

September 2017 – October 2020
University of Innsbruck, Institute for Theoretical Physics, Austria
Lise Meitner Fellow in the Bio and Nano Physics group of Prof. Thomas Franosch

August 2015 – July 2017
Aalto University, Department of Applied Physics, Finland
Postdoctoral researcher in the Complex Systems and Materials group
Supervisors: Prof. Mikko Alava and Prof. Stefano Zapperi

Education

2012 – 2016 Australian National University
Conferred December 2016
Doctor of Philosophy in Computational Chemistry
Title: An Investigation Into the Significance of Dissipation in Statistical Mechanics
Supervisors: Prof. Denis Evans and Dr. Stephen Williams

2008 – 2011 Australian National University
Bachelor of Philosophy (Science)
Awarded the University Medal and first class Honours in Chemistry
Honours thesis title: Computational Demonstration of the Fluctuation Theorem with a Parallel RC Circuit

2010 University of California, Berkeley
One semester overseas exchange

2006 – 2007 Narrabundah College
University Admissions Index (UAI) of 99.95, Dux of school

Research Fellowships

2021: Discovery Early Career Researcher Award (DECRA) ($415,283 AUD)
Project title: Extracting the hidden structure of glass from particle vibrations.
2019: Austrian Science Fund (FWF) Lise Meitner Programme (EUR 156,140)
Project title: Characterization of liquids with modulated density profiles

Funding, Scholarships, Prizes, and Awards

2023: Selby Research Award ($21,000 AUD)
Project title: Breaking the second law of thermodynamics with thermal fluctuations
2022: Physical Chemistry Division ECR talk prize at the RACI Congress, Brisbane
2022: National Computational Merit Allocation Scheme (1,000kSU ≈ $40,000 AUD)
2021: Pawsey Centre for Extreme Scale Readiness (PaCER) program ($144,000 AUD)
Project title: Towards a molecular level understanding of flow-induced physical and chemical reactions
2021: National Computational Merit Allocation Scheme (500kSU ≈ $20,000 AUD)
2020: Best ECR talk at the Statistical Mechanics of Soft Matter Meeting, Brisbane
2018: AIP 2018 ANN Education travel grant ($373 AUD)
2017: Aalto School of Science Education Network in Condensed Matter and Materials Physics Travel Support (EUR 754)
2014: Australian Nanotechnology Network Student/ECR Travel Bursary ($350 AUD)
2012: Australian Postgraduate Award (APA) ($77,116 AUD)
2012: Alan Sargeson Merit Scholarship in Chemical Science ($16,250 AUD)
2012: RSC Supplementary Scholarship ($9,750 AUD)
2011: University Medal
2010: Endeavour University Mobility in Asia and Pacific Grant ($2,500 AUD)
2008: ANU National Undergraduate Scholarship
2008: Australian National University Dux Award
2008: Lord Florey Student Prize ($2,000 AUD)

Invited conference presentations

- Science Early Career Academic Network Research Summit, Melbourne, 24 March 2023
- RACI Congress, Brisbane, 3 – 8 July 2022
    - ***Awarded early career researcher talk prize.***
- Australian Institute of Physics Summer Meeting, Melbourne, 3 – 6 December 2019
- Loch Lomond Workshop on Artificial Spin Ice, Glasgow, 26-28 June 2017

Upcoming invited presentations

- NSW Student Computational Chemistry Meeting, Kiama, 10 – 12 July 2023
    - Workshop presentation title: Molecular dynamics simulations fundamentals

Publications

M. A. Hunter, B. Demir, **C. F. Petersen**, D. J. Searles (2022) A new framework for computing a general local self-diffusion coefficient using statistical mechanics, *Journal of Chemical Theory and Computation*, 18, 6, 3357–3363

C. F. Petersen and D. J. Searles (2022) Equilibrium distribution functions: connection with microscopic dynamics, *Physical Chemistry Chemical Physics*, 24, 6383-6392

K. Hofhuis, **C. F. Petersen**, M. Saccone, S. Dhuey, A. Kleibert, S. van Dijken, and A. Farhan (2021) Geometrical frustration and competing orders in the dipolar trimerized triangular lattice, *Physical Review B*, 104, 014409, -***Highlighted as the editors' suggestion***

L. S. Schrack, **C. F. Petersen**, M. Caraglio, G. Jung, T. Franosch (2021) Tagged-particle motion in quasi-confined colloidal hard-sphere liquids, *Journal of Statistical Mechanics: Theory and Experiment,* 043301

A. Farhan, M. Saccone, **C. F. Petersen**, S. Dhuey, K. Hofhuis, R. Mansell, R. V. Chopdekar, A. Scholl, T. Lippert, S. van Dijken (2020) Geometrical Frustration and Planar Triangular Antiferromagnetism in Quasi-Three-Dimensional Artificial Spin Architecture, *Physical Review Letters*, *125*, 267203

G. Jung and **C. F. Petersen** (2020) Confinement-induced demixing and crystallization, *Physical Review Research*. 22, 033207

L. S. Schrack, **C. F. Petersen**, G. Jung, M. Caraglio, T. Franosch (2020) Dynamic properties of quasi-confined colloidal hard-sphere liquids near the glass transition, *Journal of Statistical Mechanics: Theory and Experiment*, 093301

C. F. Petersen, L. S. Schrack, T. Franosch (2019) Static properties of quasi-confined hard-sphere fluids, *Journal of Statistical Mechanics: Theory and Experiment*, 8, 083216

C. F. Petersen, T. Franosch (2019) Anomalous transport in the soft-sphere Lorentz model, *Soft Matter*, 15, 3906

A. Farhan, M. Saccone, **C. F. Petersen**, S. Dhuey, R. V. Chopdekar, Y.-L. Huang, N. Kent, Z. Chen, M. J. Alava, T. Lippert, A. Scholl, S. van Dijken (2019) Emergent magnetic monopole dynamics in macroscopically degenerate artificial spin ice, *Science Advances,* 5, eaav6380

M. Hanifour, **C. F. Petersen**, M. J. Alava, S. Zapperi (2018) Mechanics of disordered auxetic metamaterials, *The European Physical Journal B*, 91, 271

C. F. Petersen, A. Farhan, S. Dhuey, Z. Chen, J. M. Alava, A. Scholl, S. van Dijken (2018), Tuning magnetic ordering in a dipolar square-kite tessellation, *Applied Physics Letters*, 112, 092403

A. Farhan, **C. F. Petersen**, S. Dhuey, L. Anghinolfi, Q. H. Qin, M. Saccone, S. Velten, C. Wuth, S. Gliga, P. Mellado, M. Alava, A. Scholl, S. van Dijken (2017) Nanoscale Control of Competing Interactions and Geometrical Frustration in a Dipolar Trident Lattice. *Nature Communications*, 8, 995

A. Farhan, A. Scholl, **C. F. Petersen**, L. Anghinolfi, C. Wuth, S. Dhuey, R. V. Chopdekar, P. Mellado, M. J. Alava, S. van Dijken (2016) Thermodynamics of emergent magnetic charge screening in artificial spin ice. *Nature Communications*, 7, 12635

C. F. Petersen, D. J. Evans, S. R. Williams (2016) Dissipation in monotonic and non-monotonic relaxation to equilibrium. *The Journal of Chemical Physics*, 144, 074107

C. F. Petersen, D. J. Evans, S. R. Williams (2016) Mechanism for asymmetric bias in demonstrations of the NPI and fluctuation theorem. *Molecular Simulation*, 42, 531-541

C. F. Petersen, E. Krausz, D. J. Evans, S. R. Williams (2014) Theoretical Analysis of the Fluctuation Theorem Applied to Electric Circuits. *Communications in Theoretical Physics*, 62, 476-484

C. F. Petersen, D. J. Evans, S. R. Williams (2013) The instantaneous fluctuation theorem. *The Journal of Chemical Physics*, 139, 184106

M. Bulbrook, M. Chu, K. Deane, R. J. Doyle, J. Hinc, **C. F. Petersen**, G. Salem, N. Thorman, A. C. Willis (2010) Chiral Birch reduced tertiary phosphines: precursors to asymmetric 1,2-cyclohexenebis (tertiary phosphines). *Dalton Trans,* 39, 8878-8881

Preprints

C. F. Petersen, P. Harrowell (2023) Direct Measurement of the Structural Change Associated with Amorphous Solidification using Static Speckle Scattering, *submitted*, arXiv:2302.11872

S. Sanderson, **C. F. Petersen**, D. J. Searles (2023) Machine learning a time-local fluctuation theorem for nonequilibrium steady states, *submitted*, arXiv:2305.19457

Student Supervision

PhD students:

2021: Co-supervisor. Research topic: Computational Studies of Transport Properties in Nanomaterials

Master's thesis students:

2023: Research topic: Violations of the second law of thermodynamics in nanomagnet arrays

Undergraduate project students:

2022: Two students. Research topic: Unlocking the mysteries of glass

Bachelor's thesis projects:

2020: Thesis title: Statistical physics of cluster formation in correlated nanomagnets

2019: Thesis title: Movement of emergent magnetic monopoles in lattices of nanomagnets

2018: Thesis title: Disorder in Models of Artificial Spin Ice

Teaching

2023 The University of Melbourne

- Environmental Chemistry (lecturer)
- Specialised topics in chemistry – statistical thermodynamics (lecturer)
- Chemistry 1 (tutor)
- Advanced Practical Chemistry (senior demonstrator)

2022 The University of Sydney

- Taught scientific communication skills course for HDR students

2021 The University of Queensland

- Computational chemistry labs for Advanced Physical Chemistry (tutor)
- Chemistry 2 (teaching assistant)

2017 – 2019 University of Innsbruck

- Practical molecular dynamics section of the Computational Physics course (tutor, course designer)
- Classical Mechanics (tutorials)
- Electrodynamics (tutorials)
- Fluid Mechanics (pro-seminars)

2011 - 2012 Australian National University

- Chemistry 1 (laboratory demonstrator)
- Chemical Structure and Reactivity 1 (laboratory demonstrator)
- Chemical Structure and Reactivity 2 (laboratory demonstrator)

Outreach and Engagement

2023: Organised Melbourne University of Chemistry Society Seminars
2022: Glass expert for ANSTO's National Science Week Hackathon competition for school students
2021: Organised AIBN Institute Seminars
2019: Organised physics activities for the public at the University of Innsbruck Festival of Science
2019: Organised the Bio and Nano Physics station for the University of Innsbruck Public Open Day

Contributed Conference Presentations

- XVI International Workshop on Complex Systems, Andalo, 13 – 17 March 2023
- RACI Physical Chemistry Summer Festival, virtual, November 2021
- Statistical Mechanics of Soft Matter, Brisbane, 14-15 December 2020
  -***Awarded best early career researcher talk prize***
- Statistical Mechanics of Soft Matter, Adelaide, 16-17 December 2019
- DPG Spring Meeting of the Condensed Matter Section, Regensburg, 1 – 5 April 2019
- XV International Workshop on Complex Systems, Andalo, 17 -20 March 2019
- 23rd Australian Institute of Physics Congress, Perth, 9-13 December 2018
- Statistical Mechanics of Soft Matter, Auckland, 6-7 December 2018
- DPG Spring Meeting of the Condensed Matter Section, Berlin, 11 - 16 March 2018
- Multiscale Material Modeling, Dijon, 9-14 October 2016
- Molecular Modeling 2014, Students and Early-Career Researchers' Forum, Queensland, 30-31 July 2014
- Statistical Mechanics of Soft Matter, Melbourne, 21-22 November 2013