

## **Charlotte Petersen**

School of Chemistry  
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### Education

**2012 - 2016 Australian National University**

**Conferred December 2016**

**Doctor of Philosophy in Theoretical 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)**

First class honours in Chemistry, awarded the university medal.

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

### Employment

**December 2021 – Present**

**University of Sydney, School of Chemistry**

ARC DECRA research 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 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 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

### Funding, Scholarships, Prizes, and Awards

**2021: Discovery Early Career Researcher Award (DECRA)**

Project title: Extracting the hidden structure of glass from particle vibrations.

- 2021: Pawsey Centre for Extreme Scale Readiness (PaCER) program.  
 Project title: Towards a molecular level understanding of flow-induced physical and chemical reactions.  
 Project leader: Prof. Debra J. Bernhardt.  
 Project team: Charlotte F. Petersen, Shern R. Tee, Emily Kahl
- 2020: Best ECR talk at the Statistical Mechanics of Soft Matter Meeting, Brisbane
- 2019: Austrian Science Fund (FWF) Lise Meitner Programme  
 Project title: Characterization of liquids with modulated density profiles.  
 Co-applicant: Prof. Dr. Thomas Franosch
- 2018: AIP 2018 ANN Education travel grant
- 2017: Aalto School of Science Education Network in Condensed Matter and Materials Physics Travel Support
- 2014: Australian Nanotechnology Network Student/Early Career Researcher Travel Bursary
- 2012: Australian Postgraduate Award (APA)
- 2012: Alan Sargeson Merit Scholarship in Chemical Science
- 2012: RSC Supplementary Scholarship
- 2011: University Medal
- 2010: Endeavour University Mobility in Asia and Pacific Grant
- 2008: ANU National Undergraduate Scholarship
- 2008: Australian National University Dux Award
- 2008: Lord Florey Student Prize

#### Invited conference presentations

Australian Institute of Physics Summer Meeting, Melbourne, 3 – 6 December 2019, title: Effects of quasi-confinement on a fluid.

Loch Lomond Workshop on Artificial Spin Ice, Glasgow, 26-28 June 2017, title: Investigating artificial spin ice through lattice design.

#### Publications

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.

Contributed conference presentations

RACI Physical Chemistry Summer Festival, virtual, November 2021, title: Derivation of equilibrium distribution functions using dynamics

Statistical Mechanics of Soft Matter, Brisbane, 14-15 December 2020, title: Nanoscale control of competing interactions and geometrical frustration in a 2D spin ice analogue. *Awarded best early career researcher talk prize.*

Statistical Mechanics of Soft Matter, Adelaide, 16-17 December 2019, title: Understanding confined liquids: Confinement by periodic boundaries

DPG Spring Meeting of the Condensed Matter Section. Regensburg, 1 April – 5 April 2019, title: Anomalous transport in the soft Lorentz model of crowded media.

XV International Workshop on Complex Systems, Andalo, 17 -20 March 2019, title: Anomalous transport in soft percolating host structures.

23<sup>rd</sup> Australian Institute of Physics Congress, Perth, 9-13 December 2018, title: Soft interactions in the Lorentz model: anomalous transport in crowded media

Statistical Mechanics of Soft Matter, Auckland, 6-7 December 2018, title: Softening interactions in the Lorentz model of crowded media.

DPG Spring Meeting of the Condensed Matter Section. Berlin, 11 March - 16 March 2018, title: Nanoscale control of geometrical frustration in a dipolar trident lattice.

Multiscale Material Modeling, Dijon, 9-14 October 2016, title: Disordered Auxetic Materials.

Molecular Modeling 2014, Students and Early-Career Researches' Forum, Queensland, 30-31 July 2014, title: The Instantaneous Fluctuation Theorem in Transient and Steady State Systems.

Statistical Mechanics of Soft Matter, Melbourne, 21-22 November 2013, title: The Instantaneous Fluctuation Theorem

Poster presentations:

Interdisciplinary Challenges in Nonequilibrium Physics, Vienna (Online workshop), 12 – 16 April 2021, title: Derivation of equilibrium distribution functions from dynamics.

Beg Rohu Summer School 2019: Glasses, Jamming, and Slow Dynamics, Saint-Pierre-Quiberon, 23 June – 7 July 2019, title: Subdiffusion in porous media: soft percolating host structures.

International Soft Matter Conference, Edinburgh, 3-7 June 2019, title: Subdiffusion in soft crowded media.

Ian Snook Conference on Chemical Physics, Melbourne, 4-5 December 2014, title: The Instantaneous Fluctuation Theorem: Predicting the behavior of non-equilibrium systems.

Molecular Modeling 2014: From Biomolecules to Materials, Queensland, 31 July – 2 August 2014, title: The Instantaneous Fluctuation Theorem and its Integrated Form.

### Student Supervision

PhD students:

2021: The University of Queensland, Co-supervise one student. Thesis topic: Computational Studies of Transport Properties in Nanomaterials

Bachelor's thesis students:

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

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

2018: University of Innsbruck, Thesis title: Disorder in Models of Artificial Spin Ice.

### Teaching

#### **2021 The University of Queensland**

2021: Tutor for computational chemistry labs for Advanced Physical Chemistry course.

2021: Assessed student presentations for the Physical Chemistry Honours level course.

#### **2017 – 2019 University of Innsbruck**

2019: Designed and ran the practical molecular dynamics section of the Computational Physics course (masters level).

2017-2018: Taught selected tutorials and pro-seminars for the courses Classical Mechanics (second year undergraduate physics), Electrodynamics (third year undergraduate physics), and Continuum Mechanics - Classical Field Theory (masters level physics).

#### **2011 - 2012 Australian National University, Lab Demonstrator**

I was a laboratory demonstrator for the courses Chemistry 1, Chemical Structure and Reactivity 1 and Chemical Structure and Reactivity 2.

### Outreach

2021: Member of the AIBN Seminar Committee.

June 2019: Organised physics activities for the public at the University of Innsbruck Festival of Science.

April 2019: Organised the Bio and Nano Physics station for the University of Innsbruck Public Open Day.