Juliette Monsel

Researcher in theoretical physics

Research interests: stochastic thermodynamics, quantum open systems, quantum optics, optomechanics and electronic transport.

Gothenburg, Sweden
☎ +46 31 772 25 59
✉ monsel@chalmers.se
j4321.github.io/juliette.monsel
0000-0002-4965-6794
Nationality: French

Education

2019 **Ph.D.**, *Université Grenoble Alpes*, France.
Theoretical Physics.

2016 **M.Sc.**, *École Normale Supérieure de Lyon*, France.
Major: Physics, Mention: highest honors.

2014 **B.Sc.**, *École Normale Supérieure de Lyon*, France.
Major: Physics, Mention: highest honors.

Research experience

Since Jan. 2024 **Research specialist**, *Department of Microtechnology and Nanoscience, Chalmers University of Technology*, Gothenburg, Sweden.
Permanent researcher position in the Applied Quantum Physics Laboratory.

2020 – 2023 (3 years and 10 months) **Postdoctoral researcher**, *Department of Microtechnology and Nanoscience, Chalmers University of Technology*, Gothenburg, Sweden.
Advisor: Janine Splettstoesser. Quantum thermodynamics.
- Studied thermodynamic of electronic transport
- Analyzed optomechanical cooling in a thermodynamic perspective

2019 – 2020 (4 months) **Postdoctoral researcher**, *Institut Néel*, Grenoble, France.
Advisor: Alexia Auffèves. Quantum thermodynamics and optomechanics.
- Explored the potential of carbon nanotubes for thermodynamic experiments
- Studied stochastic thermodynamics with Kerr resonators

2016 – 2019 (3 years and 2 months) **Doctoral researcher**, *Institut Néel*, Grenoble, France.
Supervisor: Alexia Auffèves. Quantum thermodynamics and optomechanics.
- Demonstrated the potential of hybrid optomechanical systems and one-dimensional atoms to experimentally explore quantum thermodynamics
- Proposed methods to define and measure work in the quantum regime

Teaching and supervision experience

Student supervision

Since Oct. 2020 Assistant supervisor of a Ph.D. student at Chalmers.

Mar. – Nov. 2024 Co-supervisor of a master student from Grenoble INP Phelma (France) at Chalmers for a nine-month project.

Apr. – Jul. 2022 Co-supervisor of a master student from École Normale Supérieure de Lyon (France) at Chalmers for a four-month project.

Oct. 2021 – Jul. 2022 Co-supervisor of a master student from University of Regensburg (Germany) at Chalmers.

2016 Informal co-supervisor of a first-year master student during his two-month internship at the Institut Néel, Grenoble, France.

Teaching

Feb. 2024 **Winter school on ultrafast thermodynamics**, *Chalmers*, Gothenburg, Sweden.
Tutorial session for the lecture "Nanoscale thermodynamics - the role of fluctuations".

2017, 2018 (64 hours/year) **Teaching Assistant**, *Université Grenoble Alpes*, France.
Newtonian mechanics for first year undergraduates.
- Supervised students during tutorials (2×1,5 hours/week, ∼ 30 students) and practical work (3 hours/week, ∼ 15 students)
- Graded examinations and practical work reports
- Wrote exercises for the examinations

Training

2024 **Women's Leadership Program**, *Chalmers*, Gothenburg, Sweden.
12.5-hour program from *the Gender initiative for excellence (Genie)*.

2024 **Supervising research students**, *Chalmers*, Gothenburg, Sweden.
15-hour course on supervising doctoral students.

2016 – 2019 **Research and Higher Education (RES) label**, *Doctoral school of Physics*, Grenoble, France.
Teaching oriented Ph.D. program leading to the production of a portfolio documenting the development of my teaching and research skills (in French): `http://juliette-monsel.byethost15.com`.

2017 **How to develop as a teacher**, *Doctoral school of Physics*, Grenoble, France.
Two-day training program on communication and group animation techniques for teaching.

2016 **Introduction to the profession of teacher-researcher**, *Doctoral school of Physics*, Autrans, France.
Three-day workshop on topics related to teaching at the university.

Awards and Grants

Nov. 2022 **Travel grant** from Chalmers Foundation to go to Vienna for a research visit and the annual Quantum Thermodynamics Conference in July 2023. Budget: 1,713 €.

Apr. 2020 **Spinger Thesis Award**, including the publication of my *thesis in the Springer Theses* series which brings together a selection of the best PhD theses worldwide in physical sciences, nominated and endorsed by two recognized specialists.

Jun. 2016 **Jean-Pierre Aguilar PhD grant** from the *CFM Foundation for Research* covering my salary for three years and a funding for traveling of 4,500 €. Only five grants were awarded in 2016 and a strong preference is given to candidates proposed by doctoral schools (in Physics, Mathematics and Computer Science), which was not my case.

Publications

Summary 4 preprints, 10 peer-reviewed articles, 1 book.

Preprints

2024 J. Dunlop, F. Cerisola, J. Monsel, S. Sevitz, J. Tabanera-Bravo, J. Dexter, F. Fedele, N. Ares, J. Anders, *Extra cost of erasure due to quantum lifetime broadening*. arXiv: 2410.02546.

J. Monsel, M. Acciai, R. Sánchez, J. Splettstoesser, *Autonomous demon exploiting heat and information at the trajectory level*. arXiv: 2409.05823.

L. Du, J. Monsel, W. Wieczorek, J. Splettstoesser, *Coherent feedback control for cavity optomechanical systems with a frequency-dependent mirror*. arXiv: 2405.13624.

F. Fedele, F. Cerisola, L. Bresque, F. Vigneau, J. Monsel, J. Tabanera, K. Aggarwal, J. Dexter, S. Sevitz, J. Dunlop, A. Auffèves, J. Parrondo, A. Pályi, J. Anders, N. Ares, *Coupling a single spin to high-frequency motion*. arXiv: 2402.19288.

Articles

2024 J. Monsel, A. Ciers, S. K. Manjeshwar, W. Wieczorek, J. Splettstoesser, "Dissipative and dispersive cavity optomechanics with a frequency-dependent mirror," *Physical Review A*, **109**, 043532.

J. Tabanera-Bravo, F. Vigneau, J. Monsel, K. Aggarwal, L. Bresque, F. Fedele, F. Cerisola, G. A. D. Briggs, J. Anders, A. Auffèves, J. M. R. Parrondo, N. Ares, "Stability of long-sustained oscillations induced by electron tunneling," *Physical Review Research*, **6**, 013291.

2023 J. Monsel, J. Schulenborg, J. Splettstoesser, "Non-geometric pumping effects on the performance of interacting quantum-dot heat engines," *European Physical Journal Special Topics*, **232**, 3267–3272.

S. K. Manjeshwar, A. Ciers, J. Monsel, H. Pfeifer, C. Peralle, S. M. Wang, P. Tassin, W. Wieczorek, "Integrated microcavity optomechanics with a suspended photonic crystal mirror above a distributed Bragg reflector," *Optics Express*, **31**, 30212–30226, First theory author, article featured in Spotlight on Optics.

L. Tesser, M. Acciai, C. Spånslätt, J. Monsel, J. Splettstoesser, "Charge, spin, and heat shot noises in the absence of average currents: Conditions on bounds at zero and finite frequencies," *Physical Review B*, **107**, 075409.

2022 F. Vigneau, J. Monsel, J. Tabanera, K. Aggarwal, L. Bresque, F. Fedele, F. Cerisola, G. A. D. Briggs, J. Anders, J. M. R. Parrondo, A. Auffèves, N. Ares, "Ultrastrong coupling between electron tunneling and mechanical motion," *Physical Review Research*, **4**, 043168, First theory author.

J. Monsel, J. Schulenborg, T. Baquet, J. Splettstoesser, "Geometric energy transport and refrigeration with driven quantum dots," *Physical Review B*, **106**, 035405, Editors' suggestion.

2021 J. Monsel, N. Dashti, S. K. Manjeshwar, J. Eriksson, H. Ernbrink, E. Olsson, E. Torneus, W. Wieczorek, J. Splettstoesser, "Optomechanical cooling with coherent and squeezed light: The thermodynamic cost of opening the heat valve," *Physical Review A*, **103**, 063519.

2020 J. Monsel, M. Fellous-Asiani, B. Huard, A. Auffèves, "The Energetic Cost of Work Extraction," *Physical Review Letters*, **124**, 130601.

2018 J. Monsel, C. Elouard, A. Auffèves, "An autonomous quantum machine to measure the thermodynamic arrow of time," *npj Quantum Information*, **4**, 59.

Books

2020 J. Monsel, *Quantum Thermodynamics and Optomechanics* (Springer Theses, Recognizing Outstanding Ph.D. Research). Springer International Publishing.

Conferences and seminars

Summary 6 invited talks, 17 contributed talks, 12 seminars and 13 poster presentations (not listed).

Invited talks

2024 "Energy transport and refrigeration with driven quantum dots," *General Conference of the Condensed Matter Division (CMD31)*, invited by Mykhailo Moskalets and Rosa López, Braga, Portugal, Sep. 2 – 6.

"Energy transport and refrigeration with driven quantum dots," *Condensed Matter and Quantum Materials (CMQM 2024)*, invited by Jonathan Keeling, University of St. Andrews, Scotland, UK, Jul. 2 – 5.

2023 "Role of nonequilibrium fluctuations and feedback in a quantum dot thermal machine," *5th Nottingham Workshop on Quantum Non-Equilibrium Dynamics*, invited by Kay Brandner, Nottingham, UK, Nov. 13 – 15.

2022 "Geometric energy transport and refrigeration with driven quantum dots," *Workshop on Geometric Resources for Quantum Engineering II*, invited by Diego Frustaglia, University of Seville, Spain, Nov. 24 – 25.

"Stochastic entropy production in electron transport through quantum dots," *Quantum Energetics Workshop*, invited by Alexia Auffèves, Institut Néel, Grenoble, France, Jun. 7.

2019 "An autonomous quantum machine to measure the thermodynamic arrow of time," *Workshop on Quantum Networks and Non-equilibrium Systems*, invited by Andrew Briggs and Natalia Ares, Obergurgl, Austria, Jan. 16 – 19.

Contributed talks

2024 "Dissipative and dispersive cavity optomechanics with a suspended frequency-dependent mirror," *New Avenues in Quantum Materials 2024*, Chalmers University of Technology, Gothenburg, Sweden, Aug. 29 – 31.

"Role of nonequilibrium fluctuations and feedback in a quantum dot thermal machine," *DPG Spring Meeting of the Condensed Matter Section (SKM)*, Berlin, Germany, Mar. 18 – 22.

2023 "Role of nonequilibrium fluctuations and feedback in a quantum dot thermal machine," *Quantum Energy Initiative Workshop (QEI2023)*, Singapore, Nov. 20 – 24.

"Dissipative cavity optomechanics with a suspended frequency-dependent mirror," *DPG Spring Meeting of the Atomic, Molecular, Quantum Optics and Photonics Section (SAMOP)*, Hannover, Germany, Mar. 5 – 10.

"Ultrastrong coupling between electron tunneling and mechanical motion," *Information as Fuel FQxI workshop*, Obergurgl, Austria, Feb. 3 – 8.

2021 "Optomechanical cooling with coherent and squeezed light: the thermodynamic cost of opening the heat valve," *Quantum Thermodynamics Conference (QTD2021)*, Online (Genève, Switzerland), Oct. 4 – 8.

"Optomechanical cooling with coherent and squeezed light: the thermodynamic cost of opening the heat valve," *Condensed matter days (JMC)*, Online (Rennes, France), Aug. 24 – 27.

"Optomechanical cooling with coherent and squeezed light: the thermodynamic cost of opening the heat valve," *Thermodynamics and Information in the Quantum Regime*, Online, Jul. 7 – 9.

"Optomechanical cooling with coherent and squeezed light: The thermodynamic cost of opening the heat valve," *Joint European Thermodynamics Conference*, Online (Prague, Czech Republic), Jun. 14 – 18.

2020 "The energetic cost of work extraction," *Quantum Thermodynamics Conference (QTD2020)*, Online (Barcelona, Spain), Oct. 13 – 17.

2019 "An autonomous optomechanical energy converter," *Annual Meeting of the GDR MecaQ (French research network on Quantum Optomechanics, Nanomechanics)*, Palaiseau, France, Oct. 3 – 4.

"An autonomous quantum machine to measure the thermodynamic arrow of time," *Quantum Thermodynamics Conference (QTD2019)*, Espoo, Finland, Jun. 23 – 28.

"Measuring the arrow of time in a hybrid optomechanical system," *II Workshop on Quantum Information and Thermodynamics*, Natal, Brazil, Mar. 11 – 22.

2018 "Energy conversion in a hybrid optomechanical system: Laser-like behavior and cooling," *Condensed matter days (JMC)*, Grenoble, France, Aug. 27 – 31.

2017 "Fluctuation theorems in a hybrid optomechanical system," *Annual colloquium of the GDR IQFA (French research network on Quantum Engineering, from Fundamental Aspects to Applications)*, Nice, France, Nov. 29 – Dec. 1.

"Measuring the arrow of time in a hybrid optomechanical system," *VI Quantum Information Workshop*, Paraty, Brazil, Aug. 21 – 25.

"Thermodynamics and hybrid optomechanical system," *Congress of the French Physical Society (SFP)*, Orsay, France, Jul. 3 – 7.

Invited seminars

2024 "Energy transport and refrigeration with driven quantum dots," *Condensed Matter Physics Seminar*, invited by Matthias Geilhufe, Chalmers University of Technology, Gothenburg, Sweden, Apr. 30.

"Optomechanical cooling with coherent and squeezed light and frequency-dependent mirrors: The thermodynamic cost of opening the heat valve," *Seminar*, invited by Janet Anders, University of Potsdam, Germany, Mar. 26.

2023 "Optomechanical cooling with coherent and squeezed light and frequency-dependent mirrors: The thermodynamic cost of opening the heat valve," *Seminar*, invited by Mario Ciampini and Nikolai Kiesel, University of Vienna, Austria, Jul. 13.

"Optomechanical cooling with coherent and squeezed light and frequency-dependent mirrors: The thermodynamic cost of opening the heat valve," *Seminar*, invited by Martin Bowen, Institute of Physics and Chemistry of Materials of Strasbourg, CNRS – Unistra, France, Apr. 12.

"Energy transport and refrigeration with driven quantum dots," *Seminar*, invited by Ville Maisi, Center for Nanoscience, Lund University, Sweden, Mar. 31.

"Optomechanical cooling with coherent and squeezed light," *Seminar*, invited by Romain Albert, in Gerhard Kirchmair's group, Institute for Quantum Optics and Quantum Information, Innsbruck, Austria, Feb. 8.

2022 "Geometric energy transport and refrigeration with driven quantum dots," *Seminar*, invited by Natalia Ares, Department of Engineering, University of Oxford, UK, Apr. 8.

2021 "Quantum thermodynamics," *SmallTalks [about Nanoscience]*, Chalmers University of Technology, Gothenburg, Sweden, Dec. 6.

"Optomechanical cooling with coherent and squeezed light," *United Kingdom Optomechanics Research Network (UniKORN) Seminar Series*, Online, Nov. 3.

"Optomechanical cooling with coherent and squeezed light: The thermodynamic cost of opening the heat valve," *NanoThermodynamics seminar*, invited by Peter Samuelsson, Online (Lund University), Mar. 19.

2019 "Thermodynamics of hybrid optomechanical systems," *Seminar*, invited by Janine Splettstoesser, Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden, Sep. 11.

2018 "Fluctuation theorems in a hybrid optomechanical system," *Seminar*, invited by Natalia Ares, Department of Materials, University of Oxford, UK, Mar. 7.

Academic Citizenship

Reviewer Phys. Rev. Lett., Sci. Rep., Phys. Rev. A, J. Stat. Mech. Theory Exp., Phys. Rev. E, J. Phys. A Math., New J. Phys., Commun. Phys.

Mentor Since Sep. 2024, as part of the *WiSE-WWACQT Mentorship Program* aiming at providing support for female PhD students and postdocs.

Scientific outreach

Apr. 2023 Contribution to an *outreach video* explaining the working process of scientists for the project "Nanomechanics in the solid-state for quantum information thermodynamics" (NanoQIT), funded by the Foundational Question Institute (FQxI) and led by Natalia Ares from Oxford University. I am a main theory contributor in this project.

Feb. 2023 Video recording of my poster presentation on energy transport and refrigeration with quantum dots in a pedagogical way for the *FQxI YouTube channel*.

Dec. 2021 I was selected to present a seminar on quantum thermodynamics at the "SmallTalks [about Nanoscience]" series of the Nano Area of Advance at Chalmers. *The first half of the seminar* targeted to a broader audience including interested high school students.

2016 – 2019 I led children workshops in the annual Fête de la Science at Institut Néel, *Physique en Fête*, on symmetry, temperature and colours and presented my research group's activities to high school students and to the general public.

Volunteer experience

2020 – current **Cykelköket**, Gothenburg, Sweden.
The "Bike kitchen" is a nonprofit Do-It-Yourself bicycle workshop.
- Help people and taught them how to repair their bicycles
- Take part in the administration of the workshop as a board member since Sep. 2020

2017 – 2020 **uN p'Tit véLo dAnS La Tête**, Grenoble, France.
Nonprofit self-repair workshop aiming at teaching bicycle mechanics and promoting bicycle riding.
- Learned bicycle mechanics by dismantling and repairing bicycles for the association
- Explained to members of the association how to repair their bicycles
- Took part in meetings and helped organize events as a member of the board from Sep. 2018 to Feb. 2020

Skills

Languages

English	fluent	Italian	good comprehension (B2)
French	native speaker	Swedish	currently learning (B2)

Computer

Programming	Python, Git, Matlab, C++	OS	Linux, Windows, MacOS