Juliette Monsel

Researcher in theoretical physics

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Nationality: French

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

Education

2020 **Qualification**, *National Council of Universities (CNU)*, France.
Certificate allowing me to apply to "Maître de Conférence" positions, permanent Assistant Professor positions with an important teaching component, at French universities.

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

2011 – 2013 **Classe Préparatoire**, *Lycée La Martinière Monplaisir*, Lyon, France.
Two-year intensive course preparing for the competitive entrance examinations to French leading institutions of higher education. Track: Mathematics-Physics.

Research experience

2020 – current **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, 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

2016 (4 months) **Master intern**, *Institut Néel*, Grenoble, France.
Supervisor: Alexia Auffèves. Fluctuation theorems in a hybrid optomechanical system.

2015 (3 months) **Master intern**, *Institut Néel*, Grenoble, France.
Supervisor: Alexia Auffèves. Hybrid optomechanical system in the ultra-strong coupling regime.

2014 (2 months) **Bachelor intern**, *Institut Lumière Matière*, Lyon, France.
Supervisor: Julien Laverdant. Experimental control of polarization with a spatial light modulator.

Teaching experience

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

2013 – 2014 (7 months) **Tutor for homework assistance**, *Trait d'Union program*, Villeurbanne, France.
Took part in a homework assistance program for students from high schools in disadvantaged areas (2 hours/week).

Student supervision

Apr. – Jul. 2022 Co-supervisor of a master student from École Normale Supérieure de Lyon (France) at MC2, Chalmers University of Technology for a four-month project.

Oct. 2021 – Jul. 2022 Co-supervisor of a master student from University of Regensburg (Germany) at MC2, Chalmers University of Technology.

2020 – current Official assistant supervisor of a Ph.D. student at MC2, Chalmers University of Technology.

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

Training

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 – 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`.

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

Submitted **EIC Pathfinder Challenge**: *Alternative approaches to Quantum Information Processing, Communication, and Sensing*, as part of a European consortium (Austria, Germany, Czech Republic and Sweden). I took part in the proposal writing and the budget elaboration.

Submitted **Travel grant** from Chalmers Foundation (*Chalmersska forskningsfonden*) to go to Vienna for a research visit and the annual Quantum Thermodynamics Conference.

2020 **Spinger Thesis Award**, recognizing outstanding Ph.D. research.

2016 **Ph.D. grant** from the *CFM Foundation for Research*.

Publications

Preprints

2022 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*. arXiv: 2210.06051.

2021 F. Vigneau, J. Monsel, J. Tabanera, L. Bresque, F. Fedele, A. Briggs, J. Anders, J. M. R. Parrondo, A. Auffèves, N. Ares, *Ultrastrong coupling between electron tunneling and mechanical motion*, Accepted in Phys. Rev. Research. arXiv: 2103.15219.

Articles

2022 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

Invited talks

2022 "Geometric energy transport and refrigeration with driven quantum dots," *Workshop on Geometric Resources for Quantum Engineering*, 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. Website: http://www.ati.ac.at/~obergurgl2019.

Contributed talks

2021 "Optomechanical cooling with coherent and squeezed light: the thermodynamic cost of opening the heat valve," *Annual Quantum Thermodynamics Conference*, Online (Genève, Switzerland), Oct. 4 – 8. Website: https://qtd2021.ch.

"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. Website: https://jmc17.sciencesconf.org.

"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. Video: https://www.youtube.com/watch?v=5BT9kkFDPCQ.

"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. Website: https://www.jetc2021.eu.

2020 "The energetic cost of work extraction," *Annual Quantum Thermodynamics Conference*, Online (Barcelona, Spain), Oct. 13 – 17. Video: http://qtd2020.icfo.eu/index.php/2020/10/08/juliette-monsel/.

2019 "An autonomous optomechanical energy converter," *Annual Meeting of the GDR MecaQ (French research network on Quantum Optomechanics, Nanomechanics)*, Palaiseau, France, Oct. 3 – 4. Website: https://mecaqcolloq2019.sciencesconf.org/.

"An autonomous quantum machine to measure the thermodynamic arrow of time," *Annual Quantum Thermodynamics Conference*, Espoo, Finland, Jun. 23 – 28. Website: https://qtd2019.aalto.fi/.

"Measuring the arrow of time in a hybrid optomechanical system," *II Workshop on Quantum Information and Thermodynamics*, Natal, Brazil, Mar. 11 – 22. Video: https://www.youtube.com/watch?v=jhzOAz8H2UU.

2018 "Energy conversion in a hybrid optomechanical system: Laser-like behavior and cooling," *Condensed matter days (JMC)*, Grenoble, France, Aug. 27 – 31. Website: https://jmc2018.sciencesconf.org/.

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. Website: https://congressfp.sciencesconf.org.

Invited seminars

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]*, MC2, Chalmers University of Technology, Dec. 6. Website: https://www.chalmers.se/en/research/strong/nano/calendar/Pages/ei_nano_seminar_6_dec.aspx.

"Optomechanical cooling with coherent and squeezed light," *UniKORN Seminar Series*, Online, Nov. 3. Website: `https://www.optomechanics.net/?page_id=83`.

"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.

Contributed posters

2022 "Geometric energy transport and refrigeration with driven quantum dots," *Frontier of Quantum and Mesoscopic Thermodynamics*, Prague, Czech Republic, Aug. 1 – 6. Website: `https://fqmt.fzu.cz/22`.

"Geometric energy transport and refrigeration with driven quantum dots," *Annual Quantum Thermodynamics Conference*, Online (Belfast, UK), Jun. 27 – Jul. 1. Website: `https://blogs.qub.ac.uk/qtd2022/posters/`.

2021 "Geometric energy transport in time-dependently driven quantum dots," *QuESTech Final Conference*, Gothenburg, Sweden, Nov. 9 – 10.

"Geometric energy transport in time-dependently driven quantum dots," *Excellence Initiative Nano Poster Day*, Gothenburg, Sweden, Oct. 26.

2020 "Optomechanical cooling efficiency: The cost of turning a valve," *Quantum Technology International Conference*, Online (Barcelona, Spain), Nov. 2 – 4. Website: `https://premc.org/conferences/qtech-quantum-technology/`.

"The energetic cost of work extraction," *Workshop on Prospects of Ultrastrong light-matter interactions*, Gothenburg, Sweden, Sep. 13 – 17.

2017 "Measuring the arrow of time in a hybrid optomechanical system," *VI Quantum Information School*, Paraty, Brazil, Aug. 14 – 18.

"Measuring the arrow of time in a hybrid optomechanical system," *Annual Quantum Thermodynamics Conference*, Oxford, United Kingdom, Mar. 13 – 17.

Service to the community

Reviewer Phys. Rev. A (2021, 2022), J. Stat. Mech. Theory Exp. (2021), Phys. Rev. E (2021, 2022), J. Phys. A Math. (2021), New J. Phys. (2020), Commun. Phys. (2020)

Scientific outreach Speaker and guide (2016 – 2019) at the "Fête de la Science", a yearly national French event during which scientific institutions promote science through animations and laboratory tours aimed at high school students and the general public.

Volunteer experience

2020 – current **Cykelköket**, Gothenburg, Sweden.
The "Bike kitchen" is an open Do-It-Yourself bicycle workshop.
- Helped people repair their bikes
- Took part in the administration of the workshop as a board member

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

Skills

Languages

English fluent
French native speaker
Italian good comprehension (B2)
Swedish currently learning (B1)

Computer

Programming Python, Git, Matlab, C++
Operating systems Linux, Windows, MacOS
Text processing LaTeX, LibreOffice

Interests

Bicycle My main mean of transportation since 2017, volunteer mechanics and board member in Do-It-Yourself bicycle workshops.

Programming *Open-source software* development with Python, answering questions on *StackOverflow*.

Reading Novels, mostly mysteries, in English (Michael Connelly, Peter Robinson) and in French (Fred Vargas).