

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 **Postdoctoral researcher**, *Institut Néel*, Grenoble, France.
(4 months) Advisor: Alexia Auffèves. Quantum thermodynamics and optomechanics.
 - Explored the potential of carbon nanotubes for thermodynamic experiments
 - Studied stochastic thermodynamics with Kerr resonators
- 2016 – 2019 **Doctoral researcher**, *Institut Néel*, Grenoble, France.
(3 years, 2 months) 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 **Master intern**, *Institut Néel*, Grenoble, France.
(4 months) Supervisor: Alexia Auffèves. Fluctuation theorems in a hybrid optomechanical system.
- 2015 **Master intern**, *Institut Néel*, Grenoble, France.
(3 months) Supervisor: Alexia Auffèves. Hybrid optomechanical system in the ultra-strong coupling regime.
- 2014 **Bachelor intern**, *Institut Lumière Matière*, Lyon, France.
(2 months) 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 ($2 \times 1,5$ 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

- Oct. 2021 –
current Co-supervisor of the master student Juliane Graf from University of Regensburg (Germany) at MC2, Chalmers University of Technology for a six-month project.
- 2020 – current Official assistant supervisor of the Ph.D. student Ludovico Tesser at MC2, Chalmers University of Technology.
- 2016 Informal co-supervisor of the master student Cauê Moreno Kersul de Castro Carvalho 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

- 2020 Springer Thesis Award, recognizing outstanding Ph.D. research
- 2016 Ph.D. grant from the CFM Foundation for Research

Publications

Articles

- Preprint 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*. arXiv: 2103.15219.
- 2021 J. Monsel, N. Dashti, S. K. Manjeshwar, J. Eriksson, H. Ernbrink, E. Olsson, E. Torneus, W. Wiczorek, 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*, ser. Springer Theses, Recognizing Outstanding Ph.D. Research. Springer International Publishing.

Conferences and seminars

Invited talks

2019 J. Monsel, C. Elouard, A. Auffèves, "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 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," *Annual Quantum Thermodynamics Conference*, Online (Genève, Switzerland), Oct. 4 – 8. Website: <https://qtd2021.ch>.

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," *Condensed matter days (JMC)*, Online (Rennes, France), Aug. 24 – 27. Website: <https://jmc17.sciencesconf.org>.

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," *Thermodynamics and Information in the Quantum Regime*, Online, Jul. 7 – 9. Video: <https://www.youtube.com/watch?v=5BT9kkFDPCQ>.

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," *Joint European Thermodynamics Conference*, Online (Prague, Czech Republic), Jun. 14 – 18. Website: <https://www.jetc2021.eu>.

2020 J. Monsel, M. Fellous-Asiani, B. Huard, A. Auffèves, "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 J. Monsel, C. Elouard, M. Richard, A. Auffèves, “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/>.
- J. Monsel, C. Elouard, A. Auffèves, “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/>.
- J. Monsel, C. Elouard, A. Auffèves, “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=jhz0Az8H2UU>.
- 2018 J. Monsel, C. Elouard, M. Richard, A. Auffèves, “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 J. Monsel, C. Elouard, A. Auffèves, “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.
- J. Monsel, C. Elouard, A. Auffèves, “Measuring the arrow of time in a hybrid optomechanical system,” *VI Quantum Information Workshop*, Paraty, Brazil, Aug. 21 – 25.
- J. Monsel, C. Elouard, A. Auffèves, “Thermodynamics and hybrid optomechanical system,” *Congress of the French Physical Society (SFP)*, Orsay, France, Jul. 3 – 7. Website: <https://congressfp.sciencesconf.org>.

Invited seminars

- 2021 J. Monsel, “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.
- J. Monsel, “Optomechanical cooling with coherent and squeezed light,” *UniKORN Seminar Series*, Online, Nov. 3. Website: https://www.optomechanics.net/?page_id=83.
- J. Monsel, “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 J. Monsel, “Thermodynamics of hybrid optomechanical systems,” *Seminar, invited by Janine Splettstoesser*, Department of Microtechnology and Nanoscience, Chalmers University of Technology, Gothenburg, Sweden, Sep. 11.
- 2018 J. Monsel, “Fluctuation theorems in a hybrid optomechanical system,” *Seminar, invited by Natalia Ares*, Department of Materials, University of Oxford, UK, Mar. 7.

Contributed posters

2020 J. Monsel, N. Dashti, S. K. Manjeshwar, J. Splettstoesser, W. Wieczorek, "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/>.

J. Monsel, M. Fellous-Asiani, B. Huard, A. Auffèves, "The energetic cost of work extraction," *Workshop on Prospects of Ultrastrong light-matter interactions*, Gothenburg, Sweden, Sep. 13 – 17.

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

J. Monsel, C. Elouard, A. Auffèves, "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), J. Stat. Mech. Theory Exp. (2021), Phys. Rev. E (2021), 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

CLES 2 certificate of B2 level

French native speaker

Italian good oral and written comprehension

Swedish currently learning

following B1 course at Chalmers

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