

PAUL MENCZEL

RESEARCH OBJECTIVE

To understand the laws of thermodynamics on the smallest scales, to explore the performance of nanoscopic thermal devices, and to provide guidelines for the optimal implementation of thermal machines in practice.

PROFESSIONAL EXPERIENCE

Postdoc	RIKEN, Theoretical Quantum Physics Laboratory (Japan) Research on the thermodynamics of strongly coupled open quantum systems, focusing on theoretical methods which treat some environmental degrees of freedom as part of an auxiliary, larger quantum system. <i>Group leader:</i> Prof. Franco Nori	01 / 2021 — today
---------	--	-------------------------

EDUCATION

PhD	Aalto University, Department of Applied Physics (Finland) Graduated as Doctor of Science (Technology) on December 16, 2020 <i>Thesis:</i> Coherent Thermal Machines: Fluctuations and Performance <i>Advisor:</i> Prof. Christian Flindt <i>Opponent:</i> Prof. Eric Lutz	08 / 2016 — 12 / 2020
	Research visit: RIKEN (Japan) Supported by CMMP (Network in Condensed Matter and Materials Physics)	09 / 2019 — 12 / 2019
MSc	Heidelberg University, Institute for Theoretical Physics (Germany) <i>Thesis:</i> Model Building in F-Theory Using Hypercharge Fluxes <i>Advisor:</i> Dr. Eran Palti <i>Grade:</i> 1.0 (highest grade possible)	09 / 2012 — 03 / 2016
	Student Exchange, University of Helsinki (Finland) Supported by the Erasmus student exchange program	09 / 2013 — 06 / 2014
BSc	University of Stuttgart, Faculty of Mathematics and Physics (Germany) Double degree in Physics and Mathematics <i>Thesis:</i> Modelling Open Quantum Systems with Coherent States <i>Advisors:</i> Profs. Udo Seifert and Marcel Griesemer <i>Grades:</i> Physics: 1.2, Mathematics: 1.3 on a scale from 5 (worst) to 1 (best)	09 / 2008 — 09 / 2012

FELLOWSHIPS

JSPS Postdoctoral Fellowship for Research in Japan (Short-Term).

Host researcher: Prof. Franco Nori, RIKEN.

Fellowship tenure: 12 months, planned starting date: 01 / 2021 (delayed due to pandemic).

JSPS Postdoctoral Fellowship for Research in Japan (Standard).

Nominated by the *Alexander von Humboldt-Foundation* (Germany).

Host researcher: Prof. Franco Nori, RIKEN.

Fellowship tenure: 24 months, planned starting date: 11 / 2021.

PUBLICATIONS

A Cooper-Pair Box Architecture for Cyclic Quantum Heat Engines

A. Guthrie, C. D. Satrya, Y.-C. Chang, P. Menczel, F. Nori, and J. P. Pekola.
arXiv:2109.03023 [quant-ph] (2021).

Thermodynamic uncertainty relations for coherently driven open quantum systems

P. Menczel, E. Loisa, K. Brandner, and C. Flindt.
J. Phys. A **54**, 314002 (2021).

Quantum jump approach to microscopic heat engines

P. Menczel, C. Flindt, and K. Brandner.
Phys. Rev. Research **2**, 033449 (2020).

Thermodynamics of cyclic quantum amplifiers

P. Menczel, C. Flindt, and K. Brandner.
Phys. Rev. A **101**, 052106 (2020).

Limit cycles in periodically driven open quantum systems

P. Menczel and K. Brandner.
J. Phys. A **52**, 43LT01 (2019). Selected as featured article.

Two-stroke optimization scheme for mesoscopic refrigerators

P. Menczel, T. Pyh aranta, C. Flindt, and K. Brandner
Phys. Rev. B **99**, 224306 (2019).

Universal First-Passage-Time Distribution of Non-Gaussian Currents

S. Singh, P. Menczel, D. S. Golubev, I. M. Khaymovich, J. T. Peltonen, C. Flindt, K. Saito,  . Rold an,
and J. P. Pekola.
Phys. Rev. Lett. **122**, 230602 (2019).

Photon counting statistics of a microwave cavity

F. Brange, P. Menczel, and C. Flindt.
Phys. Rev. B **99**, 085418 (2019).

CONFERENCES**TALKS**

Invited talk: “Limit cycles in periodically driven open quantum systems”

Yagami Statistical Physics Seminar at Keio University, Yokohama, Japan (09 / 2019)

Contributed talk: “Thermodynamics of Cyclic Quantum Amplifiers”

Heraeus-Seminar “Quantum Thermodynamics for Young Scientists”, Bad Honnef, Germany (02 / 2020)

Contributed talk: “Thermodynamic Bounds on Dissipation in Open Quantum Systems”

DPG Spring Meeting, Berlin, Germany (03 / 2018)

Seminar talk: “Two-Stroke Optimization Scheme for Mesoscopic Refrigerators”

Aalto Quantum Physics Seminar at Aalto University, Espoo, Finland (06 / 2019)

Seminar talk: “Thermodynamic Bounds on Dissipation in Open Quantum Systems”

LTL Quantum Physics Seminar at Aalto University, Espoo, Finland (11 / 2017)

POSTER CONTRIBUTIONS

Two-Stroke Optimization Scheme for Mesoscopic Refrigerators, Quantum ThermoDynamics Conference, Espoo, Finland (06 / 2019).

Thermodynamic Bounds on the Precision of Quantum Machines, SPICE-Workshop on Quantum Thermodynamics and Transport, Mainz, Germany (05 / 2018).

Limitations on coherent work extraction in open quantum systems, Arctic School on Open Quantum Systems, Kevo, Finland (09 / 2017).

Limitations on coherent work extraction in open quantum systems, 28th International Conference on Low Temperature Physics, Gothenburg, Sweden (08 / 2017).

Limitations on coherent work extraction in open quantum systems, Seminar on Quantum Systems in and out of Equilibrium, Granada, Spain (06 / 2017).

Limitations on coherent work extraction in open quantum systems, Heraeus-Seminar “Non-Markovianity and Strong Coupling Effects in Thermodynamics”, Bad Honnef, Germany (04 / 2017).

TEACHING**SUPERVISED STUDENTS**

Eetu Loisa – Summer internship

Project title: “Thermodynamic Precision in Open Quantum Systems”

06 / 2019

08 / 2019

Tuomas Pyhäranta – Summer internship and subsequent Bachelor’s Thesis

Project title: “Optimal Control of a Quantum Refrigerator”, thesis submitted 04 / 2018

06 / 2017

04 / 2018

TEACHING ASSISTANCE

Open Quantum Systems and Quantum Thermodynamics, Aalto University <i>Assisted in the development of the course and of the lecture notes</i>	Fall '18
Quantum Field Theory in Condensed Matter Physics, Aalto University <i>Gained experience with modern teaching methods, including an escape room exam</i>	Spring '18
Theoretical Physics 4 (Quantum Mechanics), Heidelberg University	Spring '15
Theoretical Physics 3 (Electrodynamics), Heidelberg University	Fall '14
Theoretical Physics 2 (Analytical Mechanics), Heidelberg University	Spring '13
Theoretical Physics 1 (Mechanics), Heidelberg University	Fall '12
Linear Algebra and Analytical Geometry 1, University of Stuttgart	Fall '11

PEDAGOGICAL TRAINING

Participated in course “Teaching assistant as a learning instructor” (Aalto University)	Fall '17
---	----------

REFEREEING

Referee of Physical Review Letters (1), Physical Review A (2), Physical Review B (2), Physical Review E (4), Physical Review Research (3), Journal of Physics A (3), New Journal of Physics (1), Scientific Reports (1).

OTHER EXPERIENCES AND SKILLS

Voluntary Work for AEGEE – European Students' Forum: Vice president of AEGEE-Heidelberg, treasurer of AEGEE-Helsinki <i>Skills</i> : intercultural communication, team leading, public communication, bookkeeping	08 / 2015 — 12 / 2018
Student Assistant at the DKFZ (German Cancer Research Center): Assisted with organizing an international online lecture and maintained educational software <i>Skills</i> : software development in Java, administrating Adobe Connect sessions	11 / 2014 — 08 / 2015

PROGRAMMING

Python, Mathematica, C#, Java, lean

LANGUAGES

German native language
English full professional proficiency
Spanish limited working proficiency
Finnish elementary proficiency
Japanese elementary proficiency