

Postdoctoral Researcher Position in the Simons
Collaboration on New Frontiers of Superconductivity
Aalto University

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Job Title	Postdoctoral Researcher Position in the Simons Collaboration on New Frontiers of Superconductivity
Department	T304 Dept. Applied Physics
Institution	Aalto University , , Finland
Date Posted	Sep. 26, 2024
Application Deadline	Open until filled
Position Start Date	Available immediately
Job Categories	Post-Doc
Academic Field(s)	Physics - General
Job Website	https://aalto.wd3.myworkdayjobs.com/aalto/job/Otaniemi-Espoo-Finland/Postdoctoral-Researcher-Position-in-the-Simons-Collaboration-on-New-Frontiers-of-Superconductivity_R40974-2

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Job Description

Professor Päivi Törmä (Aalto University) is looking for a highly motivated Postdoctoral Researcher to work on the theory of quantum geometry and superconductivity, related to [\[url=https://www.simonssuperconductivity.org/\]](https://www.simonssuperconductivity.org/)the Simons Collaboration on New Frontiers of Superconductivity. The project will be done in close collaboration with Professor Tero Heikkilä (University of Jyväskylä).

Your role and goals

The research will focus on new frontiers of quantum geometric superconductivity such as non-equilibrium and dynamical phenomena in flat bands and includes collaboration with experimentalists.

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The goal is to understand how supercurrent and dissipative currents behave in flat band systems and in presence of quantum geometry, under non-equilibrium conditions. We are expecting to discover novel fundamental behavior and phenomena, as well as give predictions for non-equilibrium experiments and new generation of superconducting devices.

There are possibilities for research collaboration and extended visits to the following partners of the Simons Collaboration and their institutions: Andrei Bernevig (Princeton University), Kristjan Haule (Rutgers University), Miguel Marques (Ruhr University Bochum) and Andrew Millis (Columbia University and Flatiron Institute). There are also other postdoc positions available within the Simons Collaboration, see [[url=https://www.simonssuperconductivity.org/postitions](https://www.simonssuperconductivity.org/postitions)]here. The research involves close collaboration with experimentalists of the [[url=https://superc2033.com/](https://superc2033.com/)]SuperC collaboration, particularly Dmitri Efetov and Milan Allan (LMU Munich) and Pertti Hakonen (Aalto University).

We search for a Postdoctoral Researcher with strong analytical skills and experience in quantum many-body theory, preferably in the fields of superconductivity, quantum geometry, quantum transport and/or topological physics. Experience on linear response theory and Keldysh techniques is highly appreciated. Expertise on numerical methods such as dynamical mean-field theory, quantum Monte Carlo, exact diagonalization, density-functional theory, non-equilibrium methods and/or machine learning is an additional bonus.

The Quantum Dynamics group led by Päivi Törmä has pioneered the idea that quantum geometry and topology allows supercurrent and superconductivity in flat bands where non-interacting particles are localized ([[url=https://www.nature.com/articles/ncomms9944](https://www.nature.com/articles/ncomms9944)]Peotta and Törmä, Nature Communications 6, 8944 (2015)). Recently these concepts have become relevant for instance in the context of flat band superconductivity in twisted bilayer graphene ([[url=https://www.nature.com/articles/s42254-022-00466-y](https://www.nature.com/articles/s42254-022-00466-y)]Törmä, Peotta, Bernevig, Nature Reviews Physics 4, 528 (2022). Tero Heikkilä is a pioneer in flat band superconductivity, especially on the potential of this mechanism to increase the critical temperature ([[url=https://journals.aps.org/prb/abstract/10.1103/PhysRevB.83.220503](https://journals.aps.org/prb/abstract/10.1103/PhysRevB.83.220503)]Phys. Rev. B 83, 220503(R) (2011) - High-temperature surface superconductivity in topological flat-band systems (aps.org)). He is also an expert in superconducting (nano)electronics and related non-equilibrium phenomena ([[url=https://journals.aps.org/rmp/abstract/10.1103/RevModPhys.90.041001](https://journals.aps.org/rmp/abstract/10.1103/RevModPhys.90.041001)]Rev. Mod. Phys. 90, 041001 (2018) - Colloquium: Nonequilibrium effects in superconductors with a spin-splitting field (aps.org)).

Your experience and ambitions

We are looking for a bright and motivated Postdoctoral Researcher with an excellent record in the field

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of the position. Good command of English (both verbal and written) and demonstrated ability to disseminate scientific results are mandatory requirements for the position. Finnish language is not required. Applicants must be motivated to conduct research at the highest international level.

Postdoctoral Researchers must hold a PhD degree in a suitable field. Also, researchers that are finishing their PhD within a few months may apply.

What we offer

Your location will be Aalto University, Finland. You will visit University of Jyväskylä a few times per year. Extended visits of several weeks to the other institutions mentioned above are possible and will be arranged according to your wishes.

Aalto University follows the salary system of Finnish universities. The salary ranges for a postdoc from 4020€ to 4420€ per month, depending on previous experience, and the postdoc contracts will initially be made for 2 years. The contract includes Aalto University occupational healthcare.

Place and infrastructure

You will join the [[url=https://www.aalto.fi/en/department-of-applied-physics/quantum-dynamics-qd](https://www.aalto.fi/en/department-of-applied-physics/quantum-dynamics-qd)]QD group at Aalto University. The QD group explores quantum many-body physics theory, with focus on superconductivity, quantum geometry and topology, and also conducts nanophotonics experiments with Bose-Einstein condensation and topological physics themes. Computational facilities available for the project are outstanding, and completely free of charge. Aalto University has its own cluster, and the computational infrastructure and services of the national scientific computing centre [[url=https://www.csc.fi/en/home](https://www.csc.fi/en/home)]CSC are available. For instance last year, their [[url=https://www.lumi-supercomputer.eu/lumi-again-among-the-fastest-and-greenest-supercomputers-in-the-world/](https://www.lumi-supercomputer.eu/lumi-again-among-the-fastest-and-greenest-supercomputers-in-the-world/)]LUMI supercomputer ranked fifth in speed in the TOP500 list of supercomputers and is the fastest supercomputer in Europe.

For recent research outputs of the groups, please see Päivi Törmä's entry at

[[url=https://scholar.google.co.uk/citations?hl=&en&user=&7X9mPWwAAAAJ&view_op=&list_works&](https://scholar.google.co.uk/citations?hl=&en&user=&7X9mPWwAAAAJ&view_op=&list_works&)]
Scholar,

and Tero Heikkilä's entry at

[[url=https://scholar.google.com/citations?hl=&en&user=&4JQ1FGEAAAAJ&view_op=&list_works&](https://scholar.google.com/citations?hl=&en&user=&4JQ1FGEAAAAJ&view_op=&list_works&)]
Scholar.

Aalto University has six schools with nearly 13 000 students and 400 professors. It is the largest

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university in Finland focusing on education and research and technology, science, business, and arts. The QD group is located on the Otaniemi campus in Espoo (10 km from the city center of Helsinki), which is one of the largest hubs of high-tech in Northern Europe.

Join us!

To apply for the position, please submit your application including the attachments mentioned below as one single PDF document in English through our online recruitment system by clicking "Apply now!" button in our web page.

1. Letter of motivation including a maximum 2 pages research statement
2. CV including list of publications
3. Degree certificates and academic transcripts
4. Contact details of at least two referees

The deadline for applications is 31st of October 2024, but the position will remain open until filled. For additional information, kindly contact Prof. Päivi Törmä ([\[url=mailto:paivi.torma@aalto.fi\]](mailto:paivi.torma@aalto.fi)paivi.torma@aalto.fi) and/or Prof. Tero Heikkilä ([\[url=mailto:tero.t.heikkila@jyu.fi\]](mailto:tero.t.heikkila@jyu.fi)tero.t.heikkila@jyu.fi). Aalto University reserves the right for justified reasons to leave the position open, to extend the application period, reopen the application process, and to consider candidates who have not submitted applications during the application period. We aim to have a transparent and equal recruitment process, so feel free to ask us for feedback.

Please note: Aalto University's employees should apply for the position via our internal HR system Workday (Internal Jobs) by using their existing Workday user account (not via the external webpage for open positions). Aalto University's visitors should apply as external candidates with personal (not aalto) email.

Check out our new virtual campus experience: [\[url=https://virtualltour.aalto.fi/\]](https://virtualltour.aalto.fi/)Aalto University - virtual campus tour

Aalto University is where science and art meet technology and business. We shape a sustainable future by making research breakthroughs in and across our disciplines, sparking the game changers of tomorrow and creating novel solutions to major global challenges. Our community is made up of 13 000 students, 400 professors and close to 4 500 other faculty and staff working on our dynamic campus in Espoo, Greater Helsinki, Finland. Diversity is part of who we are, and we actively work to ensure our community's diversity and inclusiveness. This is why we warmly encourage qualified candidates from all backgrounds to join our community.

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At the Department of Applied Physics, our pioneering research in physical sciences creates important industrial applications that hold great technological potential. Our research focuses on Materials physics; Quantum technology; Soft & living matter; and Advanced energy solutions. Topics extend from fundamental research to important applications. We educate future generations of research and development professionals; data specialists; technology experts; inventors; and scientists for industry and society.

About Finland

Finland is a great place for living with or without family - it is a safe, politically stable and well-organized Nordic society. Finland is consistently ranked high in quality of life and was just listed, seventh year in a row, as the happiest country in the world: [[url=https://finland.fi/life-society/for-seventh-year-running-finland-is-first-in-world-happiness-report-other-nordics-in-top-7/](https://finland.fi/life-society/for-seventh-year-running-finland-is-first-in-world-happiness-report-other-nordics-in-top-7/)]For seventh year running, Finland is first in World Happiness Report - other Nordics in top 7 - thisisFINLAND. For more information about living in Finland please see: [[url=https://www.aalto.fi/en/careers-at-aalto/living-in-finland](https://www.aalto.fi/en/careers-at-aalto/living-in-finland)]Living in Finland | Aalto University.

Contact Information

Please reference Academickeys in your cover letter when applying for or inquiring about this job announcement.

Contact

Finland