Thibault Scoquart

Ph.D. · Theoretical physics

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Education

2018 — 2021 **Ph.D. Thesis** — Laboratoire Kastler Brossel, Paris, France

Out-of-equilibrium dynamics and thermalization of weakly interacting disordered Bose gases.

Supervisors: Dominique Delande and Nicolas Cherroret. Defended on the 07/12/2021.

2015 — 2017 **Master ICFP - Quantum physics** — Ecole Normale Supérieure, Rue d'Ulm, Paris, France

Quantum Physics: from atom to solid state

2014 — 2015 **Bachelor of physics** — Ecole Normale Supérieure, Rue d'Ulm, Paris, France

Entrance through the ENS/X competitive exams.

2013 — 2014 **Preparatory classes** — Lycée Louis-le-Grand, Paris, France

Research history

2025 — Present **Postdoctoral position** — LPT Toulouse, Toulouse, France

Strongly correlated fermions

Supervised by Fabien Alet and Nicolas Laflorencie. I work on a variety of topics in condensed matter, spin systems, many-body quantum dynamics and localization. We develop high-performance numerical methods for exact diagonalization and quantum dynamics simulations.

2023 — 2025 **Postdoctoral position** — Karlsruhe Institute of Technology, Karlsruhe, Germany

Condensed matter theory and many-body localization

Supervised by Igor Gornyi and Alexander Mirlin. Development of advanced numerical methods and analytical studies of the Fock-space correlation properties of families of disordered spin models exhibiting many-body localization, to understand the critical behavior of the transition at the thermodynamic limit.

2022 — 2023 **Postdoctoral position** — Karlsruhe Institute of Technology, Karlsruhe, Germany

Quantum algorithms and quantum computing

Supervised by Igor Gornyi, Alexander Schirman and Jörg Schmalian. Implementation of digital simulations of the dynamics of many-body models on NISQ with superconducting qubits (IBMQ), leading to the development/improvement of various error mitigation methods and quantum circuit implementations.

2018 — 2021 **Ph.D. thesis** — Laboratoire Kastler Brossel, Paris, France

Out-of-equilibrium dynamics of disordered Bose gases

Supervised by Dominique Delande and Nicolas Cherroret. Study of various aspects of the quenched out-of-equilibrium dynamics of weakly interacting ultracold Bose gases in the presence of disorder. Development of a diagrammatic theory for the effect of interactions on weak localization effects. Description of the onset of superfluidity and prethermalization in the system, leading to a disordered version of the BKT transition at long times.

2016 **Six month internship - Theoretical physics** — UMASS Boston, Boston, Massachusetts, USA

Exactly solvable many-body quantum problems in 1 dimension.

Supervised by Maxim Olchanyi. Development of analytic methods inspired from Bethe Ansatz to solve a variety of massive particle systems. Design of an experimentally relevant protocol to generate highly entangled states from a specific particle system, the "Quantum Galilean Cannon".

Publications

Summary: 10 publications in peer-reviewed journals.

Reviewer for: Physical Review B, Physical Review Research, Science Advances

Citations: ~125 (Google Scholar, October 2025)

H-index: 7 (Google Scholar, October 2025)

2025 T. Scoquart, I. V. Gornyi, A. D. Mirlin. *Scaling of many-body localization transitions: Quantum dynamics in Fock space and real space*. Physical Review B **112** (6), 064203

2025 H. Perrin, T. Scoquart, A. I. Pavlov, N. V. Gnezdilov. *Dynamic thermalization on noisy quantum hardware*. Communications Physics **8** (1), 95

2024 T. Scoquart, I. V. Gornyi, A. D. Mirlin. *Role of Fock-space correlations in many-body localization*. Physical Review B **109**, 214203

2024 H. Perrin*, T. Scoquart*, A. Shnirman, J. Schmalian, K. Snizhko. *Mitigating crosstalk errors by randomized compiling: Simulation of the BCS model*. Physical Review Research **6**, 013142
Note: *Equal contribution

2022 T. Scoquart, D. Delande, N. Cherroret. *Dynamical emergence of a Kosterlitz-Thouless transition in a disordered Bose gas*. Physical Review A **106**, L021301

2021 N. Cherroret, T. Scoquart, D. Delande. *Coherent multiple scattering of out-of-equilibrium interacting Bose gases*. Annals of Physics **435**, 168543

2021 T. Scoquart, P.-É. Larré, D. Delande, N. Cherroret. *Weakly interacting disordered Bose gases out of equilibrium: from multiple scattering to superfluidity*. Europhysics Letters **132**, 66001

2020 T. Scoquart, T. Wellens, D. Delande, N. Cherroret. *Quench dynamics of a weakly interacting disordered Bose gas in momentum space*. Physical Review Research **2**, 033349

2018 M. Olshanii, T. Scoquart, D. Yampolsky, V. Dunjko, S.G. Jackson. *Creating entanglement using integrals of motion*. Physical Review A **97**, 013630

2016 T. Scoquart, J.J. Seaward, S.G. Jackson, M. Olshanii. *Exactly solvable quantum few-body systems associated with the symmetries of the three-dimensional and four-dimensional icosahedra*. SciPost Physics **1** (1), 005

Schools and conferences

March--April 2025 **Conference on Emergent Phenomena in Quantum Systems and Beyond** — Talk and poster

Talk: *Digital quantum simulations of condensed matter models and error mitigation for NISQ devices*.

Poster: *Many-body localization: resonance statistics and Fock-space correlations*

Santiago, Chile

March 2025 **Argentinian-German WE-Heraeus-Seminar: Correlations and Dynamics in Low-Dimensional Quantum Systems** — Poster presentation

San Carlos de Bariloche, Argentina

September 2024	**International workshop on localization: Emergent Platforms and Novel Trends (LOCALI2024)** Oral presentation about the role of Fock-space correlations in the many-body localization transition in disordered spin systems.	MPIPKS Dresden, Germany
July 2024	**73rd Lindau Nobel laureate meeting** Invitation by the state of Baden-Württemberg to present my research on quantum computing and error mitigation. Flash talk and poster presentation, discussions with the students invited to the Nobel laureates meeting.	Island of Mainau Lindau, Germany
March 2024	**Annual meeting of the DPG (German Physical Society)** Oral presentation about digital quantum simulations of the BCS model on superconducting quantum computers, using state-of-the-art error mitigation techniques.	Univeristy of Berlin Berlin, Germany
November 2023	**International Conference on Quantum Simulation (ICQSIM 2023)** Oral presentation about various aspects of digital quantum simulation on superconducting quantum computers, error mitigation and crosstalk effects.	Ecole Polytechnique Saclay, France
November 2023	**1st colloquium of the GdR TeQ "Quantum technologies"** Poster presentation about error mitigation by virtual distillation for digital quantum simulation on superconducting qubits.	University of Montpellier Montpellier, France
December 2022	**Annual workshop of the GdR Complexe** Oral presentation of my work as a Ph.D. at the annual workshop of the Groupement de Recherche COMPLEXE, a large community interested in the behavior of waves in complex media	Institut de Physique du Globe Paris, France
June 2022	**Developer Conference of the Competence Center Quantum Computing Baden-Württemberg** Poster presentation on early work on digital quantum simulation	IBM campus Ehningen, Germany
December 2020	**Annual workshop of the GdR Complexe** Oral presentation of my work as a Ph.D. at the annual workshop of the Groupement de Recherche COMPLEXE, a large community interested in the behavior of waves in complex media	Online event internet
August 2019	**Summer School: Dynamics and disorder in quantum many-body systems far from equilibrium** One month of lectures on the dynamics of disordered many-body quantum systems, given by leading researchers in their field.	Ecole de physique des Houches Les Houches, France
August 2018	**Journées de la Matière condensée (JMC2018) of the French physics society (SFP)** 20 minutes flash-talk on my early Ph.D. work on the interplay between weak localization and weak interactions in disordered Bose gases	Université Joseph Fourier Grenoble, France
May 2018	**Summer school COMPLEX2018: Transport, mesoscopy and imaging of waves in complex media** One week of lectures on quantum transport in disordered media, localization effects and mesoscopic physics.	Institut d'Études Scientifiques de Cargèse Corsica, France

October 2017 — **Predoctoral school on cold atoms and quantum transport** — Ecole de physique des Houches, Les Houches, France

Two weeks of lectures on Cold atomic systems: general theory, laser cooling... And their most recent applications in quantum transport and mesoscopic physics.

Teaching experience

2024 and 2025 — **Exercise class for the lecture "Condensed Matter Theory II: Many-Body Theory"** — Karlsruhe Institute of Technology, Karlsruhe

Writing of exercises and weekly exercise classes with Master students during the summer semester, for the lecture of Dr. Igor Gornyi. Topics include advanced condensed matter concepts: many-body Green's functions, diagrammatic expansions, Matsubara and functional integral formalism, Luttinger liquid, Anderson localization...

2022 - 2023 — **Exercise class for the lecture "Theory of Strongly Correlated Electron Systems"** — Karlsruhe Institute of Technology, Karlsruhe

Writing of exercises and weekly exercise classes with Master students during the winter semester, for the lecture of Prof. Robert Eder. Topics include: theory of atomic orbitals, multiplet and crystal field theory, magnetic properties of solids...

March 2022 — **Mentor for the ``Quantum Ideas Factory"** — Univeristy of Heidelberg, Heidelberg

Supervising a group of Master students from all of Europe for a small prepared project on quantum error mitigation and randomized compiling. Organized by the DIGIQ-EFEQTS, a european Master certificate in quantum tehchnology.

2018 to 2020 — **Physics programming projects in C language** — Chimie ParisTech, Paris

Creation and supervision of small programming projects of physical simulations (Spin systems, Anderson Localization, Bacteria growth...) - 64h teaching missions. Supervisor: Frederic Labat.

Computer skills

Programming Python, quantum circuits SDKs (Qiskit, cirq) , C/ C++ (computational packages such as PETSC/SLEPC), Mathematica, git. Strong experience in parallel computations on HPC clusters.

Others LaTeX, Inkscape

Languages

French Mothertongue.

English Advanced/Fluent.

Spanish and German Basic understanding and small talk.