

SVEN BACHMANN

Department of Mathematics
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Swiss citizen
Born October 18, 1980

RESEARCH INTERESTS

Mathematical physics — analytic, algebraic and topological aspects

CURRENT POSITION

2024- Professor of Mathematics,
The University of British Columbia (UBC), Canada
2023- Associate member, Department of Physics and Astronomy
The University of British Columbia, Canada

PAST POSITIONS

2019-2024 Associate Professor of Mathematics,
The University of British Columbia, Canada
2017-2019 Assistant Professor of Mathematics,
The University of British Columbia, Canada
2013-2017 Professor of Applied Mathematics – W2
Institute of Mathematics, University of Munich (LMU), Germany
2013 Researcher
Institute for Theoretical Physics, ETH Zurich, Switzerland
2012-2013 Postdoctoral fellow and
2009-2012 A.J. Krener Assistant Professor
Department of Mathematics, University of California, Davis, USA
Mentor: *Prof. B. Nachtergaele*
2005 Assistant
Institute of Theoretical Physics, EPF Lausanne, Switzerland

EDUCATION

2005-2009 Doctor of Science in mathematical physics, ETH Zurich, Switzerland
Advisor: *Prof. G.M. Graf*
2000-2005 Master of Science in physics, EPF Lausanne, Switzerland
Advisor: *Prof. C.E. Pfister*
2004 Master project, Department of Applied Mathematics, University of Waterloo, Canada
Advisor: *Prof. A. Kempf*
2002-2003 Study abroad year, University of Waterloo, Canada

GRANTS & AWARDS

- 2024-2029 NSERC Discovery Grant, \$135'000
 2023-2025 NSERC-EU Consortium *Foundations of quantum computational advantage* \$113'834
 2023-2025 TLEF Innovation project, *Math and EOAS Collaborate to Improve Climate Education at UBC*, \$46'592
 2018-2024 NSERC Discovery Grant, \$115'000
 2018-2022 NSERC Discovery Grant *Accelerator Supplement*, \$120'000
 2012 NSF Travel Grant USD 2000
- 2023 *AHP Prize 2021*, €3000
 'For the most remarkable paper published in the journal *Annales Henri Poincaré*'
 2018 *AHP Prize 2016*, €3000
 2005 *Prix August Dommer* (EPFL), CHF 2000
 'University-wide best average grade for the master program'
 2002 *Prix René Cousin* (EPFL)
 'Best average grade in first and second year and special abilities in mathematics'

PUBLICATIONS — with links

- All Available on arXiv.org
 Selection A classification of G-charge Thouless pumps in 1D invertible states, 2023
 Exactness of linear response in the quantum Hall effect, 2021
 A many-body index for quantum charge transport, 2020
 The adiabatic theorem and linear response theory for extended quantum systems, 2018
 Lieb-Robinson bounds, Arveson spectrum and Haag-Ruelle scattering theory for gapped quantum spin systems, 2016

ACADEMIC TEACHING

- UBC Graduate: Quantum Theory, Functional Analysis, Topics in Mathematical Physics
 Undergraduate: Real Analysis, Elementary Differential Equations, Linear algebra, Applied complex analysis, Differential calculus
 Reading course: Differential Geometry and General Relativity
- LMU Graduate: Topologically ordered spin systems, Mathematical quantum mechanics I, Mathematical statistical physics I & II
 Undergraduate: Complex analysis, Partial differential equations
 Seminars: Theory of distributions, Asymptotic completeness for the N -body problem in QM, Matrix analysis, Explicit methods for PDEs, Introduction to the calculus of variations, Analytic inequalities, Mathematics of the quantum Hall effect
- UC Davis Graduate: Mathematical classical mechanics
 Undergraduate: Differential equations, Calculus
- ETHZ Teaching assistant: Thermodynamics, Statistical physics, Electrodynamics, General relativity, Mechanics of continuous media, Quantum field theory
- EPFL Teaching assistant: Quantum field theory, Probability and statistics, Quantum mechanics

SUPERVISION

UBC	2 postdoctoral fellows 4 PhD students 3 Master students 6 Undergraduate research projects 2 Undergraduate work-learn projects
LMU	5 Master theses 7 Bachelor theses

SERVICE TO THE COMMUNITY

Executive	Member of the Executive Committee of the International Association of Mathematical Physics (IAMP), Treasurer, 2024 – 2026
Organizer	Les Houches School of Physics, August 2026, France Session organizer: Many-body Quantum Systems & Condensed Matter Physics, <i>ICMP24</i> , July 2024, Strasbourg, France Seminar coordinator: <i>Quantum lattice seminar</i> , online, 2020-2023 BIRS Workshop <i>Topology and Entanglement in Many-Body Systems</i> , December 2020, Banff Local organizing committee: <i>ICMP18</i> , August 2018, Montreal Seminar coordinator: <i>Differential Geometry, Mathematical Physics & Partial Differential Equations</i> , UBC, 2017 – 2021
Editor	Mathematical Physics, Analysis and Geometry Advances in Theoretical and Mathematical Physics
Referee	Communications in Mathematical Physics Annales Henri Poincaré Journal of Functional Analysis Journal of the London Mathematical Society Memoirs of the American Mathematical Society Forum of Mathematics, Sigma Journal of Statistical Physics Reviews in Mathematical Physics Journal of Mathematical Physics Letters of Mathematical Physics Physical Review Letters Nature Communications

RECENT INVITED LECTURES AND TALKS

Dec '23	<i>Seminario Fismat</i> , Pontificia Universidad Católica de Chile, Santiago, Chile
Nov '23	<i>Spectral Theory Seminar</i> , University of California, Berkeley, USA
Nov '23	<i>Mathematical Physics Seminar</i> , University of California, Davis, USA
Oct '23	<i>Mathematics Colloquium</i> , UBC, Vancouver, Canada
Sep '23	<i>Many-Body Quantum Systems</i> , Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany
June '23	<i>Mathematics Seminar</i> , University of Minnesota, Minneapolis, USA
Mar '23	<i>Theory Seminar</i> , Department of Physics and Astronomy, UBC, Vancouver, Canada

- Nov '22 *Global Noncommutative Geometry* seminar, online
- Aug '22 *Quantissima in the Serenissima IV*, Venice, Italy
- July '22 Conference *Risorgimento della vita felice*, ETH, Zurich, Switzerland
- June '22 Workshop *Quantum Hall Effect and Topological Phases*, Institut de Recherche Mathématique Avancée, Strasbourg, France
- April '22 *Munich-Aarhus-Santiago Seminar in Mathematical Physics*, online
- Aug '21 *Learning from Insulators: New Trends in the Study of Conductivity of Metals*, Lorentz Center, Netherlands
- July '21 Seminar *QM3 = Quantum Matter meets Maths*, Instituto Superior Técnico, Lisbon, Portugal
- July '21 *Topological phases of matter*, Leysin, Switzerland
- June '21 *Great Lakes Mathematical Physics Meeting*, Michigan State University, USA
- May '21 *C*-algebras, K-theories and Noncommutative Geometries of Correlated Condensed Matter Systems*, Simons Center for Geometry and Physics, Stony Brook University, USA
- June '20 *Algebraic Structures in Quantum Computation IV*, UBC, Vancouver, Canada
- May '20 *One world*, IAMP mathematical physics seminar, online
- May '20 *Random Matrix & Probability Theory Seminar*, Harvard University, USA
- Nov '19 *Mathematical Physics & Probability Seminar*, UC Davis, USA
- Aug '19 *QMATH 14, Mathematical Results in Quantum Physics*, Aarhus University, Denmark
- June '19 *Topological Phases of Interacting Quantum Systems*, Casa Matemática Oaxaca, Mexico
- May '19 *Theory Canada 14*, UBC, Vancouver, Canada
- Apr '19 *Many-Body Theory, Random Operators & Matrices*, Institut Mittag-Leffler, Sweden
- Oct '18 *Quantum Information and Quantum Statistical Mechanics*, CRM Montreal, Canada
- Aug '18 *Solid Math Workshop*, McGill University, Montreal, Canada
- July '18 *SIAM Annual Meeting, Session on Quantum dynamics*, Portland, USA
- March '18 *School of Analysis and Mathematical Physics*, University of Arizona, USA

LANGUAGES – spoken and written

French: mother tongue

English: fluent

German: fluent