Dr Bruno Bertini **Curriculum Vitae**

Part I — General Information

Full Name	Bruno Bertini
Date of Birth	10/12/1988
Place of Birth	Piombino, Province of Livorno, Italy
Citizenship	Italian
Address	School of Physics and Astronomy, Edgbaston, Birmingham, UK
Phone	+44 115 74 87669
E-mail	b.bertini@bham.ac.uk
Spoken Languages	Italian (native), English

Part II — Appointments

	Proleptic Associate Professor at the University of Birmingham	from April 202
	Royal Society University Research Fellow at the University of Birmingham	from April 202
	Proleptic Lecturer at the University of Nottingham	2021 - 2024
	Royal Society University Research Fellow at the University of Nottingham	2021 - 2024
	Royal Society University Research Fellow at the University of Oxford	2020 - 2021
	Postdoctoral Fellow at the University of Ljubljana Supervisor: <i>Prof. Tomaž Prosen</i>	2017 - 2020
	Postdoctoral Fellow at SISSA, Trieste Supervisor: Prof. Pasquale Calabrese	2015 - 2017
aı	rt III — Education	
	D. Phil Student at the University of Oxford Supervisor: Prof. Fabian Essler Degree: D.Phil (PhD) in Theoretical Physics	2012 - 2015

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Viva Date: 6/10/2015

☐ Allievo (Student) at Scuola Normale Superiore di Pisa 2010 - 2012

2010 - 2012

Degree: Diploma di Licenza in Fisica

Grade: 70/70 cum laude Viva Date: 12/06/2013

☐ Master Student at the University of Pisa

Supervisors: Prof. Pasquale Calabrese and Prof. Mihail Mintchev

Degree: Laurea Magistrale in Fisica Teorica (Master's Degree in Theoretical

Physics)

Grade: 110/110 cum laude Viva Date: 17/07/2012

☐ Undergraduate Student at the University of Pisa

2007 - 2010

Supervisor: Prof. Enore Guadagnini

Degree: Laurea Triennale in Fisica (Bachelor's Degree in Physics)

Grade: 110/110 cum laude Viva Date: 28/06/2010

Part IV — Teaching Experience □ Lecturer at the University of Nottingham Course: Quantum Dynamics with Quantum Circuits (Part of the summer school New Trends in Quantum Simulation and Compu-

tation, which revolved around the simulation of condensed matter models on digital and analogue quantum devices)

Course Length: 1 hour

☐ **Lecturer** at the **GGI**, Florence

2019

2023

Course: Transport in closed one-dimensional systems (Part of the PhD school SFT 2019 - Lectures on Statistical Field Theories. The

school concerns subjects related to Statistical Physics and is held yearly at the

Galileo Galilei Institute in Florence)

Course Length: 6 hours

□ Lecturer at the University of Ljubljana

2019

(Part of a course teaching selected topics in theoretical physics to PhD students

of all physics areas) Course Length: 6 hours

□ Problem Class Tutor at the University of Oxford

Course: Selected Topics in Theoretical Physics

2013

Course: C6 Theoretical Physics

(Theoretical physics for master students of the final year)

Course Length: 1 Term

Part V — Awards

☐ **Leverhulme Trust Grant**, [joint grant with J. P. Garrahan (Nottingham), A. 2024 Gammon-Smith (Nottingham), and I. Lesanovsky (Nottingham/Tübingen)] (£244,560.00)

□ Royal Society Enhanced Research Expenses

2023

(£159,999.83) □ Royal Society Enhanced Research Expenses

2021

(£156,998.50)

□ Royal Society University Research Fellowship (£687,942.01)

2020

☐ Marie Skłodowska-Curie Actions Individual Fellowship

2020

(€212.933.76)

2019

□ Abilitazione Scientifica Nazionale: Settore 02/A2, Fascia II

(Italian National Habilitation as associate professor in Theoretical Particle Physics)

2019

□ Abilitazione Scientifica Nazionale: Settore 02/B2, Fascia II (Italian National Habilitation as associate professor in Theoretical Condensed Matter Physics)

2010

□ Selected for the master course of Scuola Normale Superiore di Pisa (Selection procedure based on a highly competitive exam, giving access to additional lectures, exclusion from tuition fees, free accommodation and meals for the entire duration of the studies)

Part VI — Summary of Scientific Achievements

Product type	Number
Published Papers (Peer Reviewed)	57
Preprints	4

Citation Record

Index	Number	Source
Total Citations	2883/4508	Web of Science/Google Scholar
Average Citations per Product	55.44/75.13	Web of Science/Google Scholar
Hirsh (H) Index	30/35	Web of Science/Google Scholar

Part VII — Recent Professional Activities

□ Editor

- Guest Editor: J. Phys. A special issue: "Quantum-circuit models for many-body physics out of equilibrium"
- Guest Editor: JSTAT special issue: "Emergent Hydrodynamics in Integrable Many-Body Systems"

□ Supervisor

Postdocs

- From 2022: Dr. Jonathon Riddell (University of Nottingham) *PhD students*
- From 2022: Molly Gibbins (University of Nottingham), co-supervised with A. Smith
- From 2021: Alessandro Foligno (University of Nottingham)

 Master students
- 2022/2023: Daniel Davis and Fergus Stevens (University of Nottingham), Fourth Year Project: "Entanglement Growth in Integrable Quantum Many-Body Systems".
- 2020/2021: Christos Kourris (University of Oxford), MMathPhys Final Dissertation: "Generating many-body dynamics with ramps".
- 2020/2021: Isaac Reid (University of Oxford), MPhys Project: "Exact operator entanglement dynamics of the reduced density matrix in dual-unitary quantum circuits", co-supervised with F. Essler.
- 2019/2020: Ana Flack (University of Ljubljana), Master Thesis: "Fluctuations of the Spectral Form Factor in the Kicked Ising chain", co-supervised with T. Prosen.

□ Organiser

- Programme "Fluctuations, Entanglements, and Chaos: Exact Results", August 28, 2023-October 8, 2023, Simons Center for Geometry and Physics, Stony Brook USA.
- Workshop "Quantum circuits and non-equilibrium dynamics", April 2023, Cambridge UK (part of the International Quantum Tensor Network initiative).
- Conference "Emergent hydrodynamics in integrable quantum many-body systems and beyond", June 2020, ICTP, Trieste Italy (online).
- Trieste-Ljubljana meeting (meeting of the statistical physics groups of SISSA, ICTP, and University of Ljubljana held three times a year), 2017-2020.

□ Referee

- Grant Applications for the European Research Council
- Scientific Journals: Phys. Rev. X, Phys. Rev. Lett., Phys. Rev. A, Phys. Rev. B., Phys. Rev. E, J. Stat. Mech., New J. Phys., J. Phys. A, JHEP, CMP, SciPost Physics

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Part	t VIII — Selection of Invited Conference and Departmental Talks Since 2020
	Exact many-body dynamics in quantum circuits via space-time duality Event: Invited seminar, Cambridge, UK Date: May 2024
	Keynote Talk: Entanglement Dynamics from Space-Time Duality Event: Conference of the Italian Statistical Physics Society, Parma, Italy Date: June 2023
	Negativity and Mutual Information after a Quench: Exact Link from Space-Time Duality Event: KITP Conference: "Noisy Intermediate-Scale Quantum Systems Systems: Ad vances and Applications", KITP Santa Barbara, USA Date: September 2022
	Growth of Rényi Entropies in Interacting Integrable Models and the Breakdown of the Quasi particle Picture Event: Conference: "Out-of-equilibrium and collective dynamics of quantum many-body systems", ETH Zurich, Switzerland Date: June 2022
	GHD and BBGKY hierarchy Event: Conference: "Integrability and Integrability Breaking", CUNY, New York, USA (on line) Date: April 2022
	Duality Approach to the Spectral Statistics Event: Spacetime Duality in Quantum Circuits (online), IIT Madras and IIT Tirupati, India Date: November 2021
	Dual-unitary circuits: non-equilibrium dynamics and spectral statistics Event: DPG meeting (online), MPIPKS Dresden, Germany Date: September 2021
	Non-equilibrium dynamics in dual-unitary circuits Event: SIAM Conference on Applications of Dynamical Systems (online) Date: May 2021
	Hydrodynamics for systems with extensive memory Event: Saturday Mornings of Theoretical Physics (online), University of Oxford, UK Date: April 2021
	No need for a bath: Relaxation in isolated quantum many-body systems Event: Oxford Theory Colloquium (online), University of Oxford, UK Date: October 2020
	"Dual-Unitary" Circuits: an exactly solvable paradigm of Chaotic Quantum Many-Body Dynamics Event: Dynamics, criticality, and universality in random quantum circuits (online), MPIPKS Dresden, Germany Date: September 2020

□ "Dual Unitary" Circuits: an exactly solvable paradigm of many-body quantum chaos Event: Invited seminar, Ecole Normale Superiéure of Paris, France

Date: February 2020

Part IX — List of Publications

Published Papers

The most rated journals are Commun. Math. Phys. [29], Rev. Phys. Mod. Phys. [31], Phys. Rev. Χ [18,28,42,50], and Rev. Lett. [3,5,6,12,15,21,30,32,38,43,44,46,48,49,52,53,54,56]. Other articles appear in Phys. Rev. B [7,8,10,17,20,24,25,36,37,41,51,55], J. Stat. Mech [1,2,4,9,11,14,35,39,45], Scipost Physics [19,22,23,33,34,40], Phys. Rev. Research [27,57], and J Phys. A Fast Track [16]. Generically the lead author is listed first and the supervising author last. The papers of which I was the main lead author are marked with an asterisk and those in which I was the main supervising author with a hash. The citations of each paper according to Web of Science (WOS) (bold), Google Scholar (GS) (italics).

- [1] *B. Bertini, D. Schuricht, F.H.L Essler, *Quantum Quench in the Sine-Gordon Model*, J. Stat. Mech. (2014) P10035. [WOS citations **88**, GS *140*].
- [2] *B. Bertini and M. Fagotti, *Pre-Relaxation in Weakly Interacting Models*, J. Stat. Mech. (2015) P07012. [WOS citations **64**, GS 67].
- [3] *B. Bertini, F.H.L. Essler, S. Groha, N.J. Robinson, Prethermalization and Thermalization in Models with Weak Integrability Breaking, Phys. Rev. Lett. 115, 180601 (2015). [WOS citations 149, GS 226].
- [4] B. Bertini, L. Piroli, P. Calabrese, *Quantum quenches in the sinh-Gordon model:* steady state and one point correlation functions, J. Stat. Mech. (2016) 063102. [WOS citations **56**, GS 72].
- [5] *B. Bertini and M. Fagotti, Determination of the Nonequilibrium Steady State Emerging from a Defect, Phys. Rev. Lett. 117, 130402 (2016). [WOS citations 66, GS 81].
- [6] *B. Bertini, M. Collura, J. De Nardis, and M. Fagotti, *Transport in Out-of-Equilibrium XXZ Chains: Exact Profiles of Charges and Currents*, Phys. Rev. Lett. 117, 207201 (2016). [Selected for a *Viewpoint* in Physics; Featured in Physics Today 72, 5, 22 (2019)] [WOS citations 480, GS 669].
- [7] *B. Bertini, F.H.L. Essler, S. Groha, N.J. Robinson, Thermalization and light cones in a model with weak integrability breaking, Phys. Rev. B 94, 245117 (2016). [WOS citations 55, GS 86].
- [8] *B. Bertini, Approximate light cone effects in a non-relativistic quantum field theory after a local quench, Phys. Rev. B **95**, 075153 (2017). [WOS citations **24**, GS *30*].
- [9] M. Mestyán, B. Bertini, L. Piroli, and P. Calabrese, Exact solution for the quench dynamics of a nested integrable system, J. Stat. Mech. (2017) 083103. [WOS citations 53, GS 68].
- [10] #L. Piroli, J. De Nardis, M. Collura, B. Bertini, and M. Fagotti, *Transport in out-of-equilibrium XXZ chains: non-ballistic behavior and correlation functions*, Phys. Rev. B 96, 115124 (2017). [WOS citations 116, GS 156].
- [11] *B. Bertini, E. Tartaglia, and P. Calabrese, *Quantum Quench in the Infinitely Repulsive Hubbard Model: The Stationary State*, J. Stat. Mech. (2017) 103107. [WOS citations **23**, GS *30*].
- [12] *B. Bertini, L. Piroli, and P. Calabrese, *Universal broadening of the light cone in low-temperature transport*, Phys. Rev. Lett. **120**, 176801 (2018). [WOS citations **36**, GS *52*].
- [13] *B. Bertini and L. Piroli, Low-Temperature Transport in Out-of-Equilibrium XXZ Chains, J. Stat. Mech. (2018) 033104. [WOS citations 35, GS 56].
- [14] *B. Bertini, E. Tartaglia, and P. Calabrese, *Entanglement and diagonal entropies* after a quench with no pair structure, J. Stat. Mech. (2018) 063104. [WOS citations 37, GS 57].

- [15] *B. Bertini, P. Kos, T. Prosen, Exact Spectral Form Factor in a Minimal Model of Many-Body Quantum Chaos, Phys. Rev. Lett. 121, 264101 (2018). [Selected for a commentary in Journal Club for Condensed Matter Physics] [WOS citations 175, GS 277].
- [16] *B. Bertini, M. Fagotti, L. Piroli, and P. Calabrese, *Entanglement evolution and generalised hydrodynamics: noninteracting systems*, J. Phys. A: Math. Theor. **51**, 39LT01 (2018). [WOS citations **77**, GS *104*].
- [17] M. Mestyán, B. Bertini, L. Piroli, and P. Calabrese, Spin-charge separation effects in the low-temperature transport of 1D Fermi gases, Phys. Rev. B 99, 014305 (2019). [WOS citations 40, GS 52].
- [18] *B. Bertini, P. Kos, and T. Prosen, *Entanglement spreading in a minimal model of maximal many-body quantum chaos*, Phys. Rev. X **9**, 021033 (2019). [WOS citations **133**, GS *213*].
- [19] *V. Alba, B. Bertini, and M. Fagotti, Entanglement evolution and generalised hydrodynamics: interacting integrable systems, SciPost Phys. 7, 005 (2019) [Scipost Select]. [WOS citations 58, GS 80].
- [20] *B. Bertini, L. Piroli, and M. Kormos, Transport in the sine-Gordon field theory: from generalized hydrodynamics to semiclassics, Phys. Rev. B 100, 035108 (2019). [WOS citations 41, GS 50].
- [21] *B. Bertini, P. Kos, and T. Prosen, *Exact Correlation Functions for Dual-Unitary Lattice Models in 1+1 Dimensions*, Phys. Rev. Lett. **123**, 210601 (2019). [WOS citations **120**, GS 222].
- [22] *B. Bertini, P. Kos, and T. Prosen, *Operator Entanglement in Local Quantum Circuits I: Maximally Chaotic Dual-Unitary Circuits*, SciPost Phys. **8**, 067 (2020) [Scipost Select]. [WOS citations **73**, GS *119*].
- [23] *B. Bertini, P. Kos, and T. Prosen, Operator Entanglement in Local Quantum Circuits II: Solitons in Chains of Qubits, SciPost Phys. 8, 068 (2020) [Scipost Select]. [WOS citations 34, GS 67].
- [24] #L. Piroli, B. Bertini, J. I. Cirac, and T. Prosen, *Exact dynamics in dual-unitary quantum circuits*, Phys. Rev. B **101**, 094304 (2020) [Editors' Suggestion]. [WOS citations **104**, GS *167*].
- [25] *B. Bertini and L. Piroli, *Scrambling in random unitary circuits: Exact results*, Phys. Rev. B **102**, 064305 (2020). [WOS citations **61**, GS 96].
- [26] *B. Bertini and P. Calabrese, Prethermalization and thermalization in entanglement dynamics, Phys. Rev. B 102, 094303 (2020). [WOS citations 12, GS 20].
- [27] A. Flack, B. Bertini, and T. Prosen, Statistics of the spectral form factor in the self-dual kicked Ising model, Phys. Rev. Research 2, 043403 (2020). [WOS citations 31, GS 47].
- [28] #P. Kos, B. Bertini, and T. Prosen, Correlations in Perturbed Dual-Unitary Circuits: Efficient Path-Integral Formula, Phys. Rev. X 11, 011022 (2021). [WOS citations 41, GS 65].
- [29] *B. Bertini, P. Kos, and T. Prosen, Random Matrix Spectral Form Factor of Dual-Unitary Quantum Circuits, Commun. Math. Phys. 387, 597-620 (2021). [WOS citations 40, GS 68]
- [30] #P. Kos, B. Bertini, and T. Prosen, Chaos and Ergodicity in Extended Quantum Systems with Noisy Driving, Phys. Rev. Lett. 126, 190601 (2021). [WOS citations 24, GS 40]
- [31] B. Bertini, F. Heidrich-Meisner, C. Karrasch, T. Prosen, R. Steinigeweg, and M. Žnidarič, Finite-temperature transport in one-dimensional quantum lattice models, Rev. Mod. Phys. 93, 025003 (2021). [WOS citations 180, GS 307]
- [32] #K. Klobas, B. Bertini, and L. Piroli, Exact Thermalization Dynamics in the "Rule 54" Quantum Cellular Automaton, Phys. Rev. Lett. 126, 160602 (2021) [Editors' Suggestion; Selected for a Viewpoint in Physics]. [WOS citations 57, GS 84]

- [33] #K. Klobas and B. Bertini, Exact relaxation to Gibbs and non-equilibrium steady states in the quantum cellular automaton Rule 54, SciPost Phys. 11, 106 (2021). [WOS citations 17, GS 29]
- [34] #K. Klobas and B. Bertini, *Entanglement dynamics in Rule 54: exact results and quasiparticle picture*, SciPost Phys. **11**, 107 (2021). [WOS citations **22**, GS 36]
- [35] #V. Alba, B. Bertini, M. Fagotti, L. Piroli, and P. Ruggiero, *Generalized-hydrodynamic approach to inhomogeneous quenches: correlations, entanglement and quantum effects*, J. Stat. Mech. (2021) 114004. [WOS citations **73**, GS *109*]
- [36] #I. Reid and B. Bertini, Entanglement barriers in dual-unitary circuits, Phys. Rev. B 104, 014301 (2021). [WOS citations 25, GS 43]
- [37] #P. Kos, T. Prosen, and B. Bertini, *Thermalization dynamics and spectral statistics of extended systems with thermalizing boundaries*, Phys. Rev. B **104**, 214303 (2021) [Editors' Suggestion]. [WOS citations **8**, GS *12*]
- [38] E. Granet, B. Bertini, and F.H.L. Essler, Duality between Weak and Strong Interactions in Quantum Gases, Phys. Rev. Lett. 128, 021604 (2021). [WOS citations 8, GS 12]
- [39] A. Bastianello, B. Bertini, B. Doyon, and R. Vasseur, Introduction to the Special Issue on Emergent Hydrodynamics in Integrable Many-Body Systems, J. Stat. Mech. (2022) 014001. [WOS citations 43, GS 73]
- [40] #E. Tartaglia, P. Calabrese, and B. Bertini, *Real-Time Evolution in the Hubbard Model with Infinite Repulsion*, SciPost Phys. **12**, 028 (2022). [WOS citations **9**, GS 18].
- [41] *B. Bertini, P. Kos, and T. Prosen, *Exact Spectral Statistics in Strongly Localised Circuits*, Phys. Rev. B **105**, 165142 (2022). [WOS citations **7**, GS *17*].
- [42] *#B. Bertini, K. Klobas, V. Alba, G. Lagnese, and P. Calabrese, Growth of Rényi Entropies in Interacting Integrable Models and the Breakdown of the Quasiparticle Picture, Phys. Rev. X 12, 031016 (2022). [WOS citations 28, GS 55].
- [43] *B. Bertini, K. Klobas, and T.-C. Lu, *Entanglement Negativity and Mutual Information after a Quantum Quench: Exact Link from Space-Time Duality*, Phys. Rev. Lett. **129**, 140503 (2022). [WOS citations **18**, GS *35*].
- [44] *B. Bertini, F.H.L. Essler, and E. Granet, *Bogoliubov-Born-Green-Kirkwood-Yvon Hierarchy and Generalized Hydrodynamics*, Phys. Rev. Lett. **128**, 190401 (2022) [Editors' Suggestion]. [WOS citations **8**, GS *12*].
- [45] #C. Rylands, B. Bertini, and P. Calabrese, Integrable quenches in the Hubbard model, J. Stat. Mech. (2022) 103103. [WOS citations 11, GS 15].
- [46] #C. Rylands, P. Calabrese, B. Bertini, Exact Solution of the BEC-to-BCS Quench in One Dimension, Phys. Rev. Lett. 130, 023001, (2023). [Editors' Suggestion] [WOS citations 7, GS 11].
- [47] #A. Foligno and B. Bertini, *Growth of entanglement of generic states under dual-unitary dynamics*, Phys. Rev. B **107**, 174311 (2023). [WOS citations **5**, GS *19*].
- [48] E. Vernier, B. Bertini, G. Giudici, and L. Piroli, *Integrable Digital Quantum Simulation: Generalized Gibbs Ensembles and Trotter Transitions*, Phys. Rev. Lett. **130**, 260401 (2023). [WOS citations **2**, GS *12*].
- [49] *#B. Bertini, P. Calabrese, M. Collura, K. Klobas, C. Rylands, *Nonequilibrium Full Counting Statistics and Symmetry-Resolved Entanglement from Space-Time Duality*, Phys. Rev. Lett. **131**, 140401 (2023). [WOS citations **0**, GS 36].
- [50] #A. Foligno, T. Zhou, and B. Bertini, *Temporal Entanglement in Chaotic Quantum Circuits*, Phys. Rev. X **13**, 041008 (2023). [WOS citations **6**, GS 28].
- [51] *#B. Bertini, P. Calabrese, M. Collura, K. Klobas, C. Rylands, *Dynamics of charge fluctuations from asymmetric initial states*, Phys. Rev. B 109, 184312 (2024). [WOS citations 0, GS 18].
- [52] *B. Bertini, T. Prosen, P. Kos, Localised Dynamics in the Floquet Quantum East Model, Phys. Rev. Lett. **132**, 080401 (2024). [WOS citations **2**, GS *14*].

- [53] #C. Rylands, K. Klobas, F. Ares, P. Calabrese, S. Murciano, and B. Bertini, *Microscopic origin of the quantum Mpemba effect in integrable systems*, Phys. Rev. Lett. 133, 010401 (2024). [Editors' Suggestion; Selected for a *Viewpoint* in Physics] [WOS citations 0, GS 23].
- [54] *B. Bertini, C. De Fazio, J. P. Garrahan, and K. Klobas, Exact quench dynamics of the Floquet quantum East model at the deterministic point, Phys. Rev. Lett. 132, 120402 (2024). [WOS citations 1, GS 14].
- [55] #M. Gibbins, A. Jafarizadeh, A. Gammon-Smith, and B. Bertini, Quench dynamics in lattices above one dimension: the free fermionic case, Phys. Rev. B 109, 224310 (2024). [WOS citations 0, GS 2].
- [56] #A. Foligno, P. Kos, and B. Bertini, Quantum information spreading in generalised dual-unitary circuits, Phys. Rev. Lett. 132, 250402 (2024). [WOS citations 0, GS 7].
- [57] #J. Riddell, C. von Keyserlingk, T. Prosen, B. Bertini, Structural Stability Hypothesis of Dual Unitary Quantum Chaos, arXiv:2402.19096 (2024) [Phys. Rev. Research in print]. [WOS citations 0, GS 1].

Preprints

- [1] #J. Riddell and B. Bertini, *Rationally independent free fermions with local hopping*, arXiv:2404.12100 (2024). [WOS citations **0**, GS *0*].
- [2] #K. Klobas, C. Rylands, and B. Bertini, *Translation symmetry restoration under random unitary dynamics*, arXiv:2406.04296 (2024). [WOS citations **0**, GS 3].
- [3] #B. Bertini, K. Klobas, P. Kos, and D. Malz, Quantum and Classical Dynamics with Random Permutation Circuits, arXiv:2407.11960 (2024). [WOS citations **0**, GS 0].
- [4] #A. Foligno, P. Calabrese, and B. Bertini, *Non-equilibrium dynamics of charged dual-unitary circuits*, arXiv:2407.21786 (2024). [WOS citations **0**, GS *0*].