

# Paolo Rinaldi

## Curriculum vitae

Institute for Applied Mathematics  
Universität Bonn  
Endenicher Allee, 60 (Bonn - Germany), Room 2.044  
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Last Update: September 2023

### Personal Data

Birth San Giovanni Bianco (BG), 27/05/1994  
Nationality Italian  
Spoken Italian (mother tongue), English  
Language

### Present Position

October 2021- **Research Associate**, *Universität Bonn*, Institute for Applied Mathematics.

### Education

- Oct. 2018 - **Ph.D. in Mathematical Physics**, *Università degli studi di Pavia*, Supervisor: Prof. Claudio Dappiaggi, Thesis: "A Novel Perturbative Approach to Stochastic Partial Differential Equations" Date of Defense: 14/01/2022.
- 7 may 2019 **Second Level Diploma**, *IUSS, institute for advanced study in Pavia*, Grade: Excellent, Supervisors: Prof. Claudio Dappiaggi, Dr. Nicolò Drago.  
Thesis: Diffusive Processes from an Algebraic Quantum Field Theory Viewpoint
- Oct. 2016 - **Master's Degree in Physics**, *Università degli studi di Pavia*, Summa Cum Laude,  
Sept. 2018 Supervisors: Prof. Mauro Carfora, Prof. Claudio Dappiaggi, Dr. Nicolò Drago.  
Thesis: Ricci Flow From Euclidean Renormalization Group Techniques, Date of Defense: September 27, 2018, Awarded with the **Grazioli Prize 2018** at the Istituto Lombardo
- 20 october 2016 **First Level Diploma**, *IUSS, institute for advanced study in Pavia*, Grade: Excellent,  
Supervisor: Dr. Claudio Dappiaggi.  
Thesis:  $C^*$ - and von Neumann Algebras: Structural Aspects of the Observables of a Quantum System
- Oct. 2013 - **Bachelor's Degree in Physics**, *Università degli studi di Pavia*, Summa Cum Laude,  
Jul. 2016 Supervisor: Dr. Claudio Dappiaggi.  
Thesis: Criteri per l'Identificazione di Osservabili in Meccanica Quantistica (Transl: Criteria for the Identification of the Observables in Quantum Mechanics), Date of Defense: July 21, 2016
- 2013-2018 **Alumnus**, *Almo Collegio Borromeo*, Pavia, Italy.
- 2013-2018 **Fellow**, *IUSS*, Institute for Advanced Study in Pavia, Italy.
- 2013 **Maturità Scientifica (High School Diploma)**, *Istituto Superiore D.M. Turollo*, Zogno (BG, Italy), mark 100/100.

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## Scientific Interests

Mathematical Physics (Algebraic) Quantum Field Theory, Renormalization, Stochastic Quantisation  
Pure Mathematics Stochastic PDEs, Microlocal Analysis, Geometric Analysis

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## Honors, Prizes and Scholarships

- 2022- **Associated members of the HCM**, *Hausdorff Center for Mathematics*, Bonn.
- June. 2020 **Premio Luigi Berzolari 2020**, *University of Pavia*, Pavia, Prize for the best master thesis of mathematical argument.
- Jul. 2019 **Miglior Laureato in Fisica**, *Award for the best Physics student (graduation) of the academic year 2017/2018*, *University of Pavia*, Pavia.
- Feb. 2019 **Grazioli Prize**, *Istituto Lombardo Accademia di Scienze e Lettere*.
- 2018 **Winner of a Ph.D. position (with scholarship) in Physics**, *Department of Physics*, *University of Pavia*.
- 2018 **Winner of a Ph.D. position (with scholarship) in Mathematics**, *Department of Mathematics*, *University of Genoa*, *refused*.
- 2017 **Mons. Giuseppe Angelini Prize**, *Associazione Alunni Almo Collegio Borromeo*, Pavia.
- 2013-2018 **Five-years IUSS Scholarship**, *Five years scholarship granted by the IUSS (Institute for Advanced Study in Pavia) to the best students of the University of Pavia*, subject to annual reconfirmation.

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## Preprints

- 2023 **A. Bonicelli, B. Costeri, C. Dappiaggi, PR**, "A Microlocal investigation of stochastic partial differential equations for spinors with an application to the Thirring model", arXiv: 2309.16376 [math-ph].
- 2023 **M. Gubinelli, PR**, "Stochastic Quantisation of the fractional  $\Phi_3^4$  Model in the Full Subcritical regime", arXiv: 2303.18112 [math-ph].
- 2022 **C. Dappiaggi, PR, F. Sclavi**, "Besov Wavefront Set", arXiv: 2206.06081 [math-ph].

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## Publications

- 2023 **C. Dappiaggi, PR, F. Sclavi**, "On a Microlocal Version of Young's Product Theorem", *MANUSCRIPTA MATHEMATICA*, <https://link.springer.com/article/10.1007/s00229-023-01510-6>.  
arXiv: 2104.12423 [math-ph]
- 2023 **A. Bonicelli, C. Dappiaggi, PR**, "An Algebraic and Microlocal Approach to the Stochastic Non-Linear Schrödinger Equation", *ANNALES HENRI POINCARÉ*, <https://doi.org/10.1007/s00023-023-01291-4>.  
arXiv: 2111.06320 [math-ph]

- 2022 **C. Dappiaggi, N. Drago, PR, L. Zambotti**, “A Microlocal Approach to Renormalization in Stochastic PDEs”, *COMMUNICATIONS IN CONTEMPORARY MATHEMATICS*, Vol. 24, Issue 07, 2150075, <https://doi.org/10.1142/S0219199721500759>.
- 2021 **PR, F. Sclavi**, “Reconstruction Theorem for Germs of Distributions on Smooth Manifolds”, *JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS*, Vol 501, Issue 2, <https://doi.org/10.1016/j.jmaa.2021.125215>, arXiv:2012.01261 [math-ph].
- 2020 **C. Dappiaggi, N. Drago, PR**, “The Algebra of Wick Polynomials of a Scalar Field on a Riemannian Manifold”, *REVIEWS IN MATHEMATICAL PHYSICS*, Vol. 32, No. 08 2050023, <https://doi.org/10.1142/S0129055X20500233>, arXiv: 1903.01258 [math-ph].
- 2020 **M. Carfora, C. Dappiaggi, N. Drago and PR**, “Ricci Flow from the Renormalization of Nonlinear Sigma Models in the Framework of Euclidean Algebraic Quantum Field Theory”, *COMMUNICATIONS IN MATHEMATICAL PHYSICS*, 374, 241–276 (2020) <https://doi.org/10.1007/s00220-019-03508-2>, arXiv:1809.07652 [math-ph].

## Talks

- 29 Mar. 2023 **Stochastic quantisation of the fractional  $\Phi^4$  model in the full subcritical regime**, *Mathematical Physics seminar*, Dipartimento di Matematica - Università di Genova, Genova, **(invited)**.
- 31 Jan. 2023 **Stochastic quantisation of the fractional  $\Phi^4$  model in the full subcritical regime**, *Mathematical Physics seminar*, Dipartimento di Matematica - Università di Trento, Trento, **(invited)**.
- 27 Jan. 2023 **Stochastic quantisation of the fractional  $\Phi^4$  model in the full subcritical regime**, *Analysis seminar*, Department of Mathematics - Heriott-Watt University, Edinburgh, **(invited)**.
- 29 Nov. 2021 **An Algebraic and Microlocal Approach to the Stochastic Non-Linear Schrödinger Equation**, *Analytical Methods in Quantum and Continuum Mechanics*, Politecnico di Torino, Torino.
- 4 Nov. 2021 **A Microlocal Approach to Renormalization in Stochastic PDEs**, *Oberseminar Stochastik – Institute for Applied Mathematics*, Universität Bonn, Bonn, **(invited)**.
- 29 Jul. 2021 **A Microlocal Approach to Renormalization in Stochastic PDEs**, *Young Reseach Symposium – ICMP 2021*, Geneva, (online talk).
- 23 Feb. 2021 **A Microlocal Approach to Non-Linear Stochastic PDEs**, *Se mi narri di Matematica*, Dipartimento di Matematica - University of Pavia, **(Invited)**.
- 1 Oct. 2020 **Renormalizing Stochastic PDEs**, *Ph.D. Seminars*, Physics Department - University of Pavia.
- 29 Nov. 2019 **Ricci Flow from Euclidean Algebraic Quantum Field Theory**, *Mathematical Physics Seminar*, Institute of Mathematics - University of Würzburg, **(Invited)**.
- 8 Nov. 2019 **Ricci Flow from the Renormalization of Nonlinear Sigma Models in the Framework of Euclidean Algebraic Quantum Field Theory**, *MYR Meeting*, Math Young Researchers Meeting, Maths Department - University of Genova.

- 14 Oct. 2019 **A New Viewpoint on Singular Stochastic PDEs**, *Ph.D. Seminars*, Physics Department - University of Pavia.
- 6 Sept. 2019 **Ricci Flow from Nonlinear Sigma Models**, *XLIV Summer School on Mathematical Physics*, Gruppo Nazionale Fisica Matematica (GNFM), Ravello, Italy.
- 16 Apr. 2019 **The Algebra of Wick Polynomials of a Scalar Field on a Riemannian Manifold**, *Algebraic and Geometric Aspects in Quantum Field Theory*, Mathematical Institute, Universität Freiburg, Freiburg im Breisgau, Germany.
- 21 Feb. 2018 **Ricci Flow from Euclidean Algebraic Quantum Field Theory**, *43rd LQP Workshop*, Galileo Galilei Institute, Florence, Italy.

## Attended Workshops and Schools

- 4-6 October 2023 **Panorama in Mathematics II**, *Hausdorff Center for Mathematics*, Bonn (DE).
- 26-28 June 2023 **Frontiers in Mathematical Physics**, *Université Cergy-Pontoise*, Paris (FR).
- 18-22 July 2022 **AMS-EMS-SMF International meeting 2022**, *Campus of Université Grenoble Alpes*, Grenoble (FR).
- 24-25 June 2022 **46th LQP Workshop - Foundations and Constructive Aspects of QFT**, *Erlangen*.
- 29 Nov-3 Dec. 2021 **Analytical Methods in Quantum and Continuum Mechanics**, *Politecnico di Torino*, Torino.
- 2-7 Aug. 2021 **International Congress on Mathematical Physics – ICMP 2021**, *Geneva*, (Online attendee).
- 29-31 Jul. 2021 **Young Research Symposium – ICMP 2021**, *Geneva*, (Online attendee).
- 12-16 Oct. 2020 **Higher Structures Emerging from Renormalisation**, *Erwin Schrödinger Institute*, Wien, Online Workshop.
- 17-19 June 2020 **45th LQP Workshop - Foundations and Constructive Aspects of QFT**, *Online Workshop*.
- 4-7 Dec. 2019 **Quantum Field Theory Meets Quantum Probability**, *Department of Mathematics*, University of Rome Tor Vergata.
- 8 Nov. 2019 **MYR Meeting**, *Math Young Researchers Meeting*, Maths Department - University of Genova.
- 25-26 Oct. 2019 **44th LQP Workshop - Foundations and Constructive Aspects of QFT**, *Institute for Theoretical Physics*, Göttingen.
- 02-14 Sept. 2019 **XLIV Summer School on Mathematical Physics**, *Organized by Gruppo Nazionale Fisica Matematica (GNFM)*, Ravello, Italy.
- 20-24 May 2019 **Hypoelliptic Laplacian and Applications**, *Mathematical Institute*, Universität Freiburg, Freiburg im Breisgau, Germany.

- 15-18 Apr. **Algebraic and Geometric Aspects in Quantum Field Theory**, *Mathematical Institute, Universität Freiburg*, Freiburg im Breisgau, Germany.  
2019
- 20-22 Feb. **43rd LQP Workshop - Foundations and Constructive Aspects of QFT**, *Galileo Galilei Institute*, Firenze.  
2019

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## Short Visits

- 30 Jan - 02 Feb. 2023 **Prof. Nicolò Drago**, *Dipartimento di Matematica*, Università di Trento.
- 23-28 Jan. 2023 **Dr. Matteo Capoferri**, *Department of Mathematics*, Heriott-Watt University, Edinburgh.
- 24-30 Nov. 2019 **Dr. Nicolò Drago**, *Institute of Mathematics*, University of Würzburg.

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## Referee for Peer Reviewed Journals

**Communications in Mathematical Physics, Journal of Functional Analysis, Journal of Physics A: Mathematical and Theoretical, Physical Review D.**

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## Teaching

- WS2023 **Advanced Topics in Analysis V5B7**, *Statistical Mechanics of Lattice Systems*, Universität Bonn, 48 hours class for the Master Science in Mathematics..
- SS2023 **Graduate Seminar in Stochastic Analysis S4F2**, *Introduction to Stochastic PDEs*, Universität Bonn, 48 hours, for the Master Science in Mathematics..
- WS2022 **Graduate Seminar in Stochastic Analysis S4F2**, *Introduction to the theory of regularity structures*, Universität Bonn, 48 hours, for the Master Science in Mathematics..
- SS2022 **Assistant - Stochastic Analysis V4F1**, (*Prof. Massimiliano Gubinelli*), Universität Bonn.
- 2020-2021 **Seminars on Complex Analysis (10 hours)**, *for the class of Mathematical Methods of Physics I (Prof. Barbara Pasquini) of the B.Sc. in Physics*, Università di Pavia.
- March 2020 **Introduction to Microlocal Analysis (10 hours)**, *Introduzione all'Analisi Microlocale*, Almo Collegio Borromeo, Pavia.
- 2019-2020 **Seminars on Spectral Theory and Distribution Theory (12 hours)**, *for the class of Mathematical Methods of Physics II (Prof. Claudio Dappiaggi) of the B.Sc. in Physics*, Università di Pavia.
- 2018-2019 **Seminars on Complex Analysis (12 hours)**, *for the class of Mathematical Methods of Physics I (Prof. Barbara Pasquini) of the B.Sc. in Physics*, Università di Pavia.
- 2018-2019 **Seminars on Spectral Theory and Distribution Theory (12 hours)**, *for the class of Mathematical Methods of Physics II (Prof. Claudio Dappiaggi) of the B.Sc. in Physics*, Università di Pavia.

- November 2018 **Course on Tensorial Calculus (10 hours)**, *Introduzione al Calcolo Tensoriale*, Almo Collegio Borromeo, Pavia.
- 2018-2021 **Tutor for the area of Mathematics and Physics**, *Academic assistance to students and seminars*, Almo Collegio Borromeo, Pavia.
- 2017-2018 **Tutor of Classical Mechanics**, *15 hours*, class of the B.Sc. in Physics, Università di Pavia.

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## Thesis Co-Supervisor

- Sept. 2023 **Beatrice Costeri**, *A microlocal approach to the study of the nonlinear stochastic Dirac equation*, Università di Pavia, MSc. in Physics, 110/110 cum laude, Co-supervisor.
- Sept. 2021 **Alberto Bonicelli**, *A Microlocal Approach to the Stochastic Non-Linear Schrödinger Equation*, Università di Pavia, MSc. in Physics, 110/110 cum laude, Co-supervisor, Awarded with the **Grazioli Prize 2021** at the Istituto Lombardo.
- 2021 **Diego Salvi**, *Algebraic Approach to Non-Linear  $\sigma$  Models at Second Order in Perturbation Theory*, Università di Pavia, MSc. in Physics, 110/110, Co-supervisor.
- Sept. 2020 **Nicolò Nuca**, *Processi di Diffusione ed Equazione di Fokker-Planck*, Università di Pavia, BSc. in Physics, 106/110, Co-supervisor.
- Sept. 2019 **Alberto Bonicelli**, *Geodesics motion on Riemannian manifolds from heat flow techniques*, Università di Pavia, BSc. in Physics, 110/110 cum laude, Co-supervisor.

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## Research Projects and Grants

- 2019 **Progetto Giovani GNFM**, *"Factorization algebras vs AQFTs on Riemannian manifolds"*, Principal Investigator: Dr. Marco Benini (Dipartimento di Matematica - Università di Genova), Funded by GNFM (Gruppo Nazionale Fisica Matematica).  
Role: Participant