

Paolo Rinaldi

Curriculum vitae

Dipartimento di Fisica
Università di Pavia
Via Agostino Bassi, 8 (Pavia, Italy)
✉ paolo.rinaldi@unipv.it
🌐 <https://www.paolorinaldi.net>
Room 1-66

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Personal Data

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

Present Position

Aug. 2024 - **Assistant Professor (RTT)**, *Università di Pavia*, Dipartimento di Fisica.

Previous Positions

Oct. 2021 - **Research Associate**, *Universität Bonn*, Institute for Applied Mathematics.
Jul. 2024

Education

- Oct. 2018 - **Ph.D. in Mathematical Physics**, Università degli Studi di Pavia;
Sep. 2021 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;
Sep. 2018 Grade: Summa Cum Laude;
Supervisors: Prof. Mauro Carfora, Prof. Claudio Dappiaggi, Dr. Nicolò Drago;
Thesis: "Ricci Flow From Euclidean Renormalization Group Techniques";
Date of Defense: 27/09/2018;
Awarded with the **Grazioli Prize 2018** by the Istituto Lombardo.
- 20 Oct. 2016 **First Level Diploma**, IUSS, Institute for Advanced Study in Pavia;
Grade: Excellent;
Supervisor: Prof. 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;
 Jul. 2016 Grade: Summa Cum Laude;
 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: 21/07/2016.
- 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. Turolfo*, Zogno (BG, Italy), Grade: 100/100.

Honors, Prizes, Scholarships and Memberships

- 2022-2024 **Associated members of the HCM**, Hausdorff Center for Mathematics, Bonn
 Jun. 2020 **Premio Luigi Berzolari 2020**, Università degli Studi di Pavia,
 Prize for the best master thesis of mathematical argument
 Jul. 2019 **Miglior Laureato in Fisica**,
 Award for the best (graduate) Physics student for the academic year 2017/2018,
 Università degli Studi di Pavia
 Feb. 2019 **Grazioli Prize**, Istituto Lombardo Accademia di Scienze e Lettere
 2019- **Adesione Gruppo Nazionale Fisica Matematica**, Sezione Relatività e Teoria dei
 Campi
 2018 **Winner of a Ph.D. position (with scholarship) in Physics**, Department of
 Physics, Università degli Studi di 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-year IUSS Scholarship**,
 Granted by the IUSS (Institute for Advanced Study in Pavia) to the best students
 of the University of Pavia, subject to annual reconfirmation

Scientific Interests

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

Preprints

- [10] **On the Stochastic Sine-Gordon Model: an Interacting Field Theory Approach**,
 with A. Bonicelli and C. Dappiaggi,
 arXiv: 2311.01558 [math-ph]

- [9] **A Microlocal investigation of stochastic partial differential equations for spinors with an application to the Thirring model**,
with A. Bonicelli, B. Costeri and C. Dappiaggi,
arXiv: 2309.16376 [math-ph]
- [8] **Stochastic Quantisation of the fractional Φ_3^4 Model in the Full Subcritical regime**,
with P. Duch and M. Gubinelli,
arXiv: 2303.18112 [math-ph]

Publications

- [7] **Besov Wavefront Set**,
with C. Dappiaggi and F. Sclavi,
ANALYSIS AND MATHEMATICAL PHYSICS, 13:95 (2023),
<https://link.springer.com/article/10.1007/s13324-023-00857-z>
- [6] **On a Microlocal Version of Young's Product Theorem**,
with C. Dappiaggi and F. Sclavi,
MANUSCRIPTA MATHEMATICA (2023),
<https://link.springer.com/article/10.1007/s00229-023-01510-6>
- [5] **An Algebraic and Microlocal Approach to the Stochastic Non-Linear Schrödinger Equation**,
with A. Bonicelli and C. Dappiaggi,
ANNALES HENRI POINCARÉ, 24, 2443-2482 (2023),
<https://doi.org/10.1007/s00023-023-01291-4>
- [4] **A Microlocal Approach to Renormalization in Stochastic PDEs**,
with C. Dappiaggi, N. Drago and L. Zambotti,
COMMUNICATIONS IN CONTEMPORARY MATHEMATICS, Vol. 24, Issue 07,
2150075 (2022),
<https://doi.org/10.1142/S0219199721500759>
- [3] **Reconstruction Theorem for Germs of Distributions on Smooth Manifolds**,
with F. Sclavi,
JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS, Vol 501, Issue 2
(2021),
<https://doi.org/10.1016/j.jmaa.2021.125215>
- [2] **The Algebra of Wick Polynomials of a Scalar Field on a Riemannian Manifold**,
with C. Dappiaggi and N. Drago,
REVIEWS IN MATHEMATICAL PHYSICS, Vol. 32, No. 08 2050023 (2020),
<https://doi.org/10.1142/S0129055X20500233>
- [1] **Ricci Flow from the Renormalization of Nonlinear Sigma Models in the Framework of Euclidean Algebraic Quantum Field Theory**,
with M. Carfora, C. Dappiaggi and N. Drago,
COMMUNICATIONS IN MATHEMATICAL PHYSICS, 374, 241–276 (2020),
<https://doi.org/10.1007/s00220-019-03508-2>

Talks

- 12 Jan. 2024 **Parabolic stochastic quantisation of the fractional Φ^4 model in the full subcritical regime**, *Common trends and challenges in QFT and stochastic PDEs*, Almo Collegio Borromeo, Pavia (*invited*).
- 29 Mar. 2023 **Stochastic quantisation of the fractional Φ^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 Φ^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 Φ^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 - Università degli Studi di Pavia (*invited*).
- 1 Oct. 2020 **Renormalizing Stochastic PDEs**, *Ph.D. Seminars*, Dipartimento di Fisica - Università degli Studi di 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, Dipartimento di Matematica - Università di Genova.
- 14 Oct. 2019 **A New Viewpoint on Singular Stochastic PDEs**, *Ph.D. Seminars*, Dipartimento di Fisica - Università degli Studi di Pavia.
- 6 Sep. 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, Firenze, Italy.

Attended Workshops and Schools

- 11-12 Jan. 2024 **Common trends and challenges in QFT and stochastic PDEs**, *Almo Collegio Borromeo, Pavia (IT)*.
- 4-6 Oct. 2023 **Panorama in Mathematics II**, *Hausdorff Center for Mathematics, Bonn (DE)*.
- 26-28 Jun. 2023 **Frontiers in Mathematical Physics**, *Université Cergy-Pontoise, Paris (FR)*.
- 18-22 Jul. 2022 **AMS-EMS-SMF International meeting 2022**, *Campus of Université Grenoble Alpes, Grenoble (FR)*.
- 24-25 Jun. 2022 **46th LQP Workshop - Foundations and Constructive Aspects of QFT**, *Erlangen (DE)*.
- 29 Nov.-3 Dec. 2021 **Analytical Methods in Quantum and Continuum Mechanics**, *Politecnico di Torino, Torino (IT)*.
- 2-7 Aug. 2021 **International Congress on Mathematical Physics – ICMP 2021**, *Geneva (CH)*, (Online attendee).
- 29-31 Jul. 2021 **Young Research Symposium – ICMP 2021**, *Geneva (CH)*, (Online attendee).
- 12-16 Oct. 2020 **Higher Structures Emerging from Renormalisation**, *Erwin Schrödinger Institute, Wien (AT)*, Online Workshop.
- 17-19 Jun. 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, Roma (IT)*.
- 8 Nov. 2019 **MYR Meeting**, *Math Young Researchers Meeting, Dipartimento di Matematica - Università di Genova, Genova (IT)*.
- 25-26 Oct. 2019 **44th LQP Workshop - Foundations and Constructive Aspects of QFT**, *Institute for Theoretical Physics, Göttingen (DE)*.
- 02-14 Sep. 2019 **XLIV Summer School on Mathematical Physics**, *Organized by Gruppo Nazionale Fisica Matematica (GNFM), Ravello (IT)*.
- 20-24 May 2019 **Hypoelliptic Laplacian and Applications**, *Mathematical Institute, Universität Freiburg, Freiburg im Breisgau (DE)*.
- 15-18 Apr. 2019 **Algebraic and Geometric Aspects in Quantum Field Theory**, *Mathematical Institute, Universität Freiburg, Freiburg im Breisgau (DE)*.
- 20-22 Feb. 2019 **43rd LQP Workshop - Foundations and Constructive Aspects of QFT**, *Galileo Galilei Institute, Firenze (IT)*.

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. **Dr. Nicolò Drago**, *Institute of Mathematics*, University of Würzburg.
2019

Referee for Peer Reviewed Journals

- **Communications in Mathematical Physics**;
- **Journal of Functional Analysis**;
- **Journal of Physics A: Mathematical and Theoretical**;
- **Physica Scripta**;
- **Physical Review D**;
- **Advances in Mathematical Physics**.

Research Projects and Grants

2019 **Progetto Giovani GNFM**,
Title: “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

Teaching

- Summer Sem. **New developments in Stochastic Quantisation**, *Graduate Seminar in Analysis*
2024 *S4B1*, Universität Bonn, 4 hours per week, for the Master of Science in Mathematics.
([Chair](#))
- Dec. 2023 **Introduzione alle equazioni alle derivate parziali stocastiche**, *Almo Collegio Borromeo*, Pavia, Introductory short course (4 lectures) about stochastic PDEs for Master students in Physics and Mathematics.
([Chair](#))
- Winter Sem. **Statistical Mechanics of Lattice Systems**, *Advanced Topics in Analysis V5B7*,
2023 Universität Bonn, 4 hours per week, class for the Master of Science in Mathematics.
([Chair](#))
- Summer Sem. **Introduction to Stochastic PDEs**, *Graduate Seminar in Stochastic Analysis S4F2*,
2023 Universität Bonn, 4 hours per week, for the Master of Science in Mathematics
([Chair](#)).
- Winter Sem. **Introduction to the theory of regularity structures**, *Graduate Seminar in Stochastic Analysis S4F2*, Universität Bonn, 4 hours per week, for the Master of Science in Mathematics.
([Chair](#))
- Summer Sem. **Stochastic Analysis**, *Universität Bonn, Master of Science in Mathematics*.
2022 ([Assistant](#) to Prof. Massimiliano Gubinelli)
- 2020-2021 **Seminars on Complex Analysis**, (*10 hours*) class of *Mathematical Methods for Physics I of the B.Sc. in Physics*, Università degli Studi di Pavia.
([Assistant](#) to Prof. Barbara Pasquini)

- 2019-2020 **Seminars on Spectral Theory and Distributions Theory**, (12 hours) class of *Mathematical Methods for Physics II of the B.Sc. in Physics*, Università degli Studi di Pavia.
(Assistant to Prof. Claudio Dappiaggi)
- 2018-2019 **Seminars on Complex Analysis**, (12 hours) class of *Mathematical Methods for Physics I of the B.Sc. in Physics*, Università degli Studi di Pavia.
(Assistant to Prof. Barbara Pasquini)
- 2018-2019 **Seminars on Spectral Theory and Distributions Theory**, (12 hours) class of *Mathematical Methods for Physics II of the B.Sc. in Physics*, Università degli Studi di Pavia.
(Assistant to Prof. Claudio Dappiaggi)
- Nov. 2018 **Introduzione al Calcolo Tensoriale**, (10 hours) *Introductory course about tensor calculus for B.Sc. and M.Sc. students in Physics and Mathematics*, Almo Collegio Borromeo, Pavia.
(Chair)
- 2018-2021 **Tutor for the area of Mathematics and Physics**, *Academic assistance for B.Sc. and M.Sc. students of Physics and Mathematics*, Almo Collegio Borromeo, Pavia.
- 2017-2018 **Classical Mechanics**, 15 hours, B.Sc. in Physics, Università degli Studi di Pavia.
(Tutor for Prof. Annalisa Marzuoli)

Ph.D. Students

- Oct. 2023- **Beatrice Costeri**, *Università degli Studi di Pavia, Ph.D. in Physics*, Co-supervisor.

Thesis Co-Supervisor

- Sep. 2023 **Beatrice Costeri**,
A microlocal approach to the study of the nonlinear stochastic Dirac equation,
Università degli Studi di Pavia, M.Sc. in Physics, 110/110 cum laude,
Co-supervisor
- Dec. 2021 **Diego Salvi**,
Algebraic Approach to Non-Linear σ Models at Second Order in Perturbation Theory,
Università degli Studi di Pavia, M.Sc. in Physics, 110/110,
Co-supervisor
- Sep. 2021 **Alberto Bonicelli**,
A Microlocal Approach to the Stochastic Non-Linear Schrödinger Equation,
Università degli Studi di Pavia, M.Sc. in Physics, 110/110 cum laude,
Co-supervisor, thesis awarded with the **Grazioli Prize 2021** by the Istituto Lombardo
- Sep. 2020 **Nicolò Nuca**,
Processi di Diffusione ed Equazione di Fokker-Planck,
Università degli Studi di Pavia, B.Sc. in Physics, 106/110,
Co-supervisor

Sep. 2019 **Alberto Bonicelli**,
Geodesics motion on Riemannian manifolds from heat flow techniques,
Università degli Studi di Pavia, B.Sc. in Physics, 110/110 cum laude,
Co-supervisor