

Riccardo Molinarolo

# Curriculum Vitae

## Personal Information

Name Riccardo

Surname Molinarolo

Website <https://sites.google.com/view/riccardomolinarolo>

## Academic position

2024–2025 **Research Fellowship**, *Dipartimento per lo Sviluppo Sostenibile e la Transizione Ecologica (DiSSTE)*, Università degli Studi del Piemonte Orientale “A. Avogadro”, Vercelli, IT

- Project's title: *Questioni perturbative ed asintotiche per operatori differenziali ellittici*

- Principal investigator: Professor DAVIDE BUOSO

- From 02/04/2024 to 01/04/2025

- Project's number: 2022SENJZ3 - CUP: C53D23002550006

- Project's description: In this project we consider perturbation and asymptotic problems for elliptic differential equations. We consider several different types of perturbation: domain (regular and singular perturbation for electromagnetic, degenerate, Steklov, nonlinear and higher order problems, corner singularities, etc.), mass and geometry (eigenvalue bounds and optimization), coefficients (regularity and stability, constant/nonconstant cases). The main aim of the project is to exploit the interplay between potential theory and calculus of variations and, on a higher scale, to involve more prominently geometric ideas in unprecedented ways.

---

## Past-positions

- 2023–2024 **Research Fellowship**, *Dipartimento di Scienze Molecolari e Nanosistemi*, Università Ca' Foscari, Venezia, IT
- Project's title: *"Metodi di analisi funzionale per lo studio di problemi al contorno non lineari"*
  - Principal investigator: Professor PAOLO MUSOLINO
  - From 01/04/2023 to 31/03/2024
  - Project's number: MSCA-RISE-2020 EffectFact
  - Project's description: Lo scopo del progetto è quello di sviluppare strumenti per analizzare il comportamento delle soluzioni di problemi al contorno non lineari per equazioni e sistemi alle derivate parziali ellittiche e paraboliche (e.g., equazione di Laplace, equazione del calore, equazioni di Lamé), con attenzione ai problemi provenienti dalle applicazioni (ad esempio in relazione ai materiali compositi)
- 2022–2023 **Research Fellowship**, *Dipartimento di Matematica e Informatica "Ulisse Dini"*, Università degli Studi di Firenze, Florence, IT
- Project's title: *"Equazioni e sistemi ellittici e parabolici, identità e disuguaglianze funzionali relative e applicazioni"*
  - Principal investigator: Professor ROLANDO MAGNANINI
  - From 01/04/2022 to 31/03/2023
  - Project's number: ANDREACIANCHIPRIN 2017 - CUPB18D17000020005
  - Project's description: The main goals of the research will be to build up possible mean value properties, exact or asymptotic, for solutions of elliptic and parabolic equations and systems, possibly nonlinear.
- 2021–2022 **Research Fellowship**, *Dipartimento di Matematica e Applicazioni "Renato Cacciopoli"*, Università degli Studi di Napoli Federico II, Naples, IT
- Project's title: *"Problemi di ottimizzazione in disuguaglianze geometrico-funzionali e EDP non lineari"*
  - Principal investigator: Professor NUNZIA GAVITONE
  - From 01/07/2021 to 31/03/2022
  - Project's number: 000022\_ALTRI-CdA\_54\_2020\_FRA\_GAVITONE
  - Project's description: The research program deals with the study of geometrical and qualitative aspects of free boundary problems related to PDE's of the second order. Overdetermined problems are also included in this study since the overdetermination makes the domain itself unknown.
- 2021 **Renewal of Research Fellowship**, *Dipartimento di Matematica e Applicazioni "Renato Cacciopoli"*, Università degli Studi di Napoli Federico II, Naples, IT
- Project's title: *"Metodi variazionali per problemi stazionari ed evolutivi con singolarità e interfacce"*
  - Principal investigator: Professor FRANCESCO SOLOMBRINO
  - From 01/01/2021 to 30/06/2021
  - Project's number: 000022\_PRIN2017\_F..SOLOMBRINO
  - Project's description: Si intende studiare l'applicazione di metodi del calcolo delle variazioni a problemi stazionari o evolutivi caratterizzati dalla formazione di singolarità o da discontinuità temporali.
- 2020–2021 **Research Fellowship**, *Dipartimento di Matematica e Applicazioni "Renato Cacciopoli"*, Università degli Studi di Napoli Federico II, Naples, IT
- Project's title: *"Metodi variazionali per problemi stazionari ed evolutivi con singolarità e interfacce"*
  - Principal investigator: Professor FRANCESCO SOLOMBRINO
  - Project's number: 000022\_PRIN2017\_F..SOLOMBRINO
  - From 01/01/2020 to 31/12/2020.
  - Project's description: Si intende studiare l'applicazione di metodi del calcolo delle variazioni a problemi stazionari o evolutivi caratterizzati dalla formazione di singolarità o da discontinuità temporali.

---

## Education and formation

- 2016–2019 **Ph.D. in Mathematics**, *Department of Mathematics, Aberystwyth University, Aberystwyth, UK*  
- Thesis title: *Nonlinear transmission problems for the Laplace operator: a functional analytic approach.*  
- Supervisor: Professor MISHURIS GENNADY  
- Scientific co-supervisors: Professor MATTEO DALLA RIVA and Doctor PAOLO MUSOLINO  
- Project's number: HORIZON 2020 RISE Project "MATRIXASSAY" - 644175  
- Defence of the thesis (VIVA) on the 13<sup>th</sup> of August 2019  
- Final version with corrections and approval on the 5<sup>th</sup> of September 2019  
- PhD awarded on the 6<sup>th</sup> of September 2019  
- Project's description: This dissertation is devoted to the study of two nonlinear nonautonomous transmission boundary value problems for the Laplace operator in perturbed domains.
- 2014–2016 **Master degree in Mathematics**, *Dipartimento di Matematica "Tullio Levi-Civita", Università degli Studi di Padova, Padua, IT*  
- Thesis title: *A functional analytic approach for a nonlinear nonautonomous transmission problem.*  
- Advisor: Professor MASSIMO LANZA DE CRISTOFORIS  
- Final mark: 110/110 cum laude.
- 2011–2014 **Bachelor degree in Mathematics**, *Dipartimento di Informatica, Università degli Studi di Verona, Verona, IT*  
- Thesis Title: *Theory of elementary divisors and Sylow's Theorems*  
- Advisor: Professor LIDIA ANGELERI  
- Final mark: 110/110 cum laude.
- 2011 **High School Diploma**, *Liceo Scientifico "Girolamo Fracastoro", Verona, IT*  
- Final mark: 100/100.

---

## Period Abroad during the PhD

- 2017–2018 **University of Tulsa (visiting Professor Matteo Dalla Riva), Tulsa, USA**  
- Visiting period: from March 2017 to March 2018

---

## Research interest

- ★ Boundary value problems for second order PDE's
- ★ Singularly and regularly perturbed problems
- ★ Potential theory and integral operators
- ★ Materials science: fractures and dislocations
- ★ Elliptic and hyperbolic PDE's in moving domains
- ★ Shape optimisation and geometric analysis
- ★ Geometric and functional inequalities
- ★ Overdetermined problems and rigidity results

---

## Publications, journal papers

- (7) **R. Magnanini, R. Molinarolo, G. Poggesi**, *A general integral identity with application to a reverse Serrin problem*, J. Geom. Anal. 34, 244 (2024), DOI: 10.1007/s12220-024-01693-8
- (6) **M. Dalla Riva, P. Luzzini, R. Molinarolo, P. Musolino**, *Multi-parameter perturbations for the space-periodic heat equation*, Commun. Pure Appl. Anal., 2024, 23(2): 144-164, DOI: 10.3934/cpaa.2024004

- (5) **G. Lazzaroni, R. Molinarolo, F. Riva, F. Solombrino**, *On the wave equation on moving domains: regularity, energy balance and application to dynamic debonding*, Interfaces Free Bound. 25 (2023), no. 3, pp. 401–454, DOI: 10.4171/IFB/485
- (4) **G. Lazzaroni, R. Molinarolo, F. Solombrino**, *Radial solutions for a dynamic debonding model in dimension two*, Nonlinear Anal. 219 (2022), DOI: 10.1016/j.na.2022.112822
- (3) **M. Dalla Riva, R. Molinarolo, P. Musolino**, *Existence results for a nonlinear nonautonomous transmission problem via domain perturbation*, Proc. Roy. Soc. Edinburgh Sect. A, 1-26 (2021), DOI: 10.1017/prm.2021.60
- (2) **M. Dalla Riva, R. Molinarolo, P. Musolino**, *Local uniqueness of the solutions for a singularly perturbed nonlinear nonautonomous transmission problem*, Nonlinear Anal. 191 (2020), DOI: 10.1016/j.na.2019.111645
- (1) **R. Molinarolo**, *Existence of solutions for a singularly perturbed nonlinear nonautonomous transmission problem*, Electron. J. Differential Equations, Vol. 2019, No. 53, pp. 1-29, ISSN: 1072-6691

## Preprints and submitted papers

- (2) **R. Molinarolo**, *Existence result for a nonlinear mixed boundary value problem for the heat equation*, Submitted, <https://arxiv.org/abs/2406.18315>
- (1) **M. Dalla Riva, P. Luzzini, R. Molinarolo, P. Musolino**, *Shape perturbation of a nonlinear mixed problem for the heat equation*, Submitted, <https://arxiv.org/abs/2406.11365>

## Ongoing projects

- **M. Bonafini, V. P. Cuong Le, and R. Molinarolo**, *Fractional semilinear wave equation on time-dependent domains*, In preparation.
- **N. Gavitone, R. Molinarolo, and F. Solombrino**, *Anisotropic wave equation on moving domains*, In preparation.
- **N. Gavitone and R. Molinarolo**, *On a Serrin-type overdetermined problem with Robin boundary conditions*, In preparation.
- **R. Molinarolo, A. Roncoroni, A. Pinamonti, and G. Poggesi**, *Alexandrov's results on Riemannian manifolds*, In preparation.

## Teaching experience

- 2022–2023 **Lecturing**, Università degli Studi di Firenze, Firenze, Calcolo, Statistica  
Docente a contratto - Supporto Professor Rolando Magnanini
- 2021–2022 **Tutoring**, Università degli Studi di Napoli Federico II, Napoli, Analisi I, Ingegneria  
Supporto Professoressa Nunzia Gavitone
- 2016–2018 **Tutoring**, Aberystwyth University, Aberystwyth, Further algebra and calculus (First year, Mathematics), Calculus (First year, Mathematics)
- 2015 **Teacher for high school summer recovery course**, Liceo Scientifico “Girolamo Fracastoro”, Verona, IT

---

## Partecipation to group of research

- 2023–2024 **Gnampa Project**, *Problemi ellittici e sub-ellittici: non linearità, singolarità e crescita critica*, CUP E53C23001670001, Coordinator: Francesca Anceschi.
- 2022–2023 **Gnampa Project**, *MATERIA: Modelli Analitici nella Trattazione di Evoluzioni Rate-independent e Inerziali e Applicazioni*, CUP E55F22000270001, Coordinator: Filippo Riva.

---

## Talks with invitation to conferences, workshop and meetings

- 2024 **A general integral identity with applications to a reverse Serrin problem**, *Mini-courses in Mathematical Analysis 2024*, Università degli Studi di Padova, Padua, IT, 25/06/2024
- 2024 **A nonlinear mixed boundary value problem for the heat equation: existence and shape perturbation results**, *Workshop GAMMA24, General Advances in Mathematics and Models for Applications*, Università degli Studi di Verona, Verona, IT, 24/06/2024
- 2023 **A general integral identity and the reverse Serrin problem**, *Geometric Evolution of Multi Agent Systems*, Università degli Studi di Verona, Verona, IT, 20/12/2023
- 2023 **Multi-parameter perturbations for the space periodic heat equation: a Functional Analytic Approach**, *EffectFact-FAA Seminars*, Università Ca' Foscari, Venice, IT, 19/09/2023
- 2023 **Debonding models: the wave equation on time-dependent domains and related coupled problems**, *Shape Optimization, Geometric Inequalities and Related Topics*, Università degli Studi di Napoli Federico II, Naples, IT, 30/01/2023
- 2022 **On the wave equation on moving domains: regularity, energy balance and application to dynamic debonding**, *Analysis Seminars*, Università degli Studi di Firenze, Florence, IT, 21/10/2022
- 2022 **On the wave equation on moving domains: regularity, energy balance and application to dynamic debonding**, *One Day Young Researchers Seminars*, Università degli Studi di Verona, Verona, IT, 08/07/2022
- 2022 **Weak solutions for the wave equation on a time-dependent domain**, *Seminario di Analisi Matematica*, Università degli Studi di Napoli Federico II, Naples, IT, 05/04/2022
- 2021 **Weak solutions for the wave equation on a time-dependent domain**, *Online Mini-courses in Mathematical Analysis 2021*, Università degli Studi di Padova, Padua, IT, 25/06/2021
- 2020 **Existence and uniqueness for a dynamic debonding model in dimension two**, *Online Mini-courses in Mathematical Analysis 2020*, Università degli Studi di Padova, Padua, IT, 17/10/2020
- 2019 **Nonlinear transmission boundary value problems for the Laplace operator: a functional analytic approach**, *International Mathematical Summer Center - CIME, Applied Mathematical Problems in Geophysics*, Cetraro, IT, 03/07/2019
- 2019 **Existence results for a nonlinear nonautonomous trasmission problem via domain perturbation**, *Minicourses in Mathematical Analysis 2019*, Università degli Studi di Padova, Padua IT, 27/06/2019
- 2018 **A singularly perturbed nonlinear non-autonomous transmission problem**, *Functional Analytic Approach Training Day*, Aberystwyth University, Aberystwyth, UK, 23/07/2018

- 2018 **A singularly perturbed nonlinear non-autonomous trasmission problem**, *15th International Conference on Integral Methods in Science and Engineering*, University of Brighton, Brighton, UK, 19/07/2018
- 2018 **A singularly perturbed nonlinear non-autonomous trasmission problem**, *Third year reaserch presentation*, Aberystwyth University, Aberystwyth, UK, 18/06/2018
- 2017 **A singularly perturbed nonlinear non-autonomous trasmission problem**, *Reaserch Presentation Day*, University of Tulsa, Tulsa, USA, /09/2017
- 2016 **A singularly perturbed nonlinear non-autonomous trasmission problem**, *Matrixassay Workshop, Poster Presentation*, University of Dublin, Dublin, IR, 15/06/2016

## --- Attended conferences, workshops and seminars

- 2023 **Shape Optimization, Geometric Inequalities and Related Topics**, *Università degli Studi di Napoli Federico II, Naples, IT*, 30/01/2023 - 31/01/2023
- 2022 **Geometric Analysis and PDEs at PoliMi**, *Politecnico di Milano, Milan, IT*, 05/12/2022
- 2022 **One Day Young Researchers Seminars**, *Università degli Studi di Verona, Verona, IT*, 08/07/2022
- 2022 **Geometric Analysis and PDE on Garda Lake**, *Gargnano sul Garda, IT*, 8/06/2022 - 10/06/2022
- 2022 **XXXI Convegno Nazionale di Calcolo delle Variazioni**, *Levico Terme, IT*, 9/05/2022 - 13/05/2022
- 2021 **Analytical Methods in Quantum and Continuum Mechanics, Winter School In Turin**, *Politecnico di Torino, Turin, IT*, 29/11/2021 - 03/12/2021
- 2021 **Geometric theory of PDE's and sharp functional inequality (online)**, *Accademia Nazionale dei Lincei, IT*, 25/09/2021
- 2021 **Variational methods and applications (online)**, *Centro di ricerca Ennio de Giorgi, Pisa, IT*, 06/09/2021 - 10/09/2021
- 2021 **Online Mini-courses in Mathematical Analysis**, *Università degli Studi di Padova, Padua, IT*, 21/06/2021 - 25/06/2021
- 2021 **Winterschool on Analysis and Applied Mathematics (online)**, *Munster University, Munster, GE*, 22/02/2021 - 26/02/2021
- 2021 **Scientific Colloquium at SSM (online)**, *Scuola superiore meridionale, Naples, IT*, 18/02/2021
- 2020 **Online Mini-courses in Mathematical Analysis**, *Università degli Studi di Padova, Padua, IT*, 14/10/2020 - 17/10/2020
- 2020 **Workshop "VaMeNoPh" 2020 (online)**, *Università degli studi di Napoli Federico II, Naples, IT*, 23/09/2020 - 25/09/2020
- 2020 **Workshop on Calculus of Variations and PDEs**, *Università degli studi di Napoli "Parthenope", Naples, IT*, 13/02/2020
- 2020 **XXX Convegno Nazionale di Calcolo delle Variazioni**, *Levico Terme, IT*, 03/02/2020 - 07/02/2020
- 2019 **International Mathematical Summer Center - CIME, Applied Mathematical Problems in Geophysics**, *Cetraro, IT*, 01/07/2019 - 05/07/2019
- 2019 **Minicourses in Mathematical Analysis**, *Università degli Studi di Padova, Padua, IT*, 24/06/2019 - 28/06/2019

- 2019 **Seminar of Professor Jurgen Appells**, *Università degli Studi di Padova, Padua, IT*, 03/04/2019
- 2018 **Functional Analytic Approach Training Day**, *Aberystwyth University, Aberystwyth, UK*, 23/07/2018
- 2018 **15th International Conference on Integral Methods in Science and Engineering**, *University of Brighton, Brighton, UK*, 16/07/2018 - 20/07/2018
- 2018 **Third year reaserch presentation**, *Aberystwyth University, Aberystwyth, UK*, 18/06/2018
- 2018 **Brescia-Trento Nonlinear Day**, *Università Cattolica del Sacro Cuore, Brescia, IT*, 25/05/2018
- 2018 **Welsh Maths Colloquium, Gregynog Colloquium**, *Gregynog, UK*, 21/05/2018 - 23/05/2018
- 2017 **Analysis of Robust Asymptotic Methods in Numerical Simulation in Mechanics**, *University of Pau, Pau, FR*, 12/06/2017 - 13/06/2017
- 2016 **14th International Conference on Integral Methods in Science and Engineering**, *Università degli Studi di Padova, Padua, IT*, 25/07/2016 - 29/07/2016
- 2016 **Minicourses in Mathematical Analysis**, *Università degli Studi di Padova, Padua, IT*, 27/06/2016 - 01/07/2016
- 2016 **Matrixassay Workshop, Poster Presentation**, *University of Dublin, Dublin, IR*, 15/06/2016
- 2016 **Welsh Maths Colloquium, Gregynog Colloquium**, *Gregynog, UK*, 23/05/2016 - 25/05/2016

---

## Schools and annual seminars

- 2022 - 2023 **Analysis Seminars**, *Università degli Studi di Firenze, Florence, IT*
- January 2021 **PhD course: Variational methods in material mechanics: Landau-de Gennes and Griffith's functionals (online)**, *Università degli studi di Napoli Federico II, Naples, IT*
- 2021 - 2022 **Seminario di Analisi Matematica**, *Università degli Studi di Napoli Federico II, Naples, IT*
- 2020 - 2021 **Analysis Seminar (online)**, *Università di Trento, Trento, IT*
- 2020 - 2021 **Online Seminar on Mathematical Methods in the Theory of Electromagnetism (online)**, *Università degli Studi di Padova, Padua, IT*

---

## PhD Courses

- 2018 **PGM3310 - Entrepreneurship for Research Students**, *Aberystwyth University, Aberystwyth, UK*
- 2017 **PGM2010 - Research Skills in Mathematics, Physics and Computer Science**, *Aberystwyth University, Aberystwyth, UK*
- 2017 **PGM2610 - Reading and Writing Development Group**, *Aberystwyth University, Aberystwyth, UK*
- 2016 **PGM1610 - Public Engagement and Impact**, *Aberystwyth University, Aberystwyth, UK*
- 2016 **PGM9005 - Ethics, Plagiarism and Academic Practice for Research Students**, *Aberystwyth University, Aberystwyth, UK*

---

## Computer skills

Intermediate  $\LaTeX$ , Matlab, Microsoft Windows  
Basic JAVA

---

## Languages

Italian Mother tongue  
English Fluent  
French Basic

I hereby declare everything is written here corresponds to truth and the declarations in the curriculum are made in accordance to articles 46 e 47 del D.P.R. 445/2000.

Verona, June 27, 2024