

## ELISABETTA ROCCA, CURRICULUM VITAE

### CONTACT

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Born in Broni (Pavia) 8.28.1976, Italian citizenship

### RESEARCH FIELDS

- **Main areas:** Analysis of Partial Differential Equations, Continuum Thermomechanics, Fluid mechanics, Biological problems, in particular:
  - Well-posedness of PDE systems arising from phase transition-separation phenomena and from medical-biological problems like tumor growth phenomena
  - Existence of solutions for coupled Navier-Stokes systems
  - Nonlocal effects in phase transitions phenomena
  - Long time behaviour and study of the attractors for nonlinear/singular phase-field systems
  - Inverse problems: identification of memory kernels in PDE systems
  - Optimal Control Problems for nonlinear PDE systems applied to Biology, Mechanics and Fluid Dynamics

### EDUCATION

- Ph.D. in *Matematica e Calcolo Scientifico*, the February 19, 2004, University of Pavia, Italy, with the thesis: “Some phase field models of Penrose-Fife type”, advisor Prof. Gianni Gilardi.
- SAFI Advanced School, Institute for Advanced Study - IUSS, Pavia, the December 16, 2002.
- *Laurea in Matematica*, the July 1, 1999, University of Pavia, Italy, Grade: 110/110 cum laude with the thesis: “Analisi asintotica rispetto al parametro di rilassamento in tempo di un modello di campo di fase conservativo con memoria”, advisor Prof. Pierluigi Colli.

## POSITIONS

- November 2018 - present: *Full Professor* at the Department of Mathematics of the University of Pavia, Italy.
- March 2016 - October 2018: *Associate Professor* at the Department of Mathematics of the University of Pavia, Italy.
- November 2012 - present: *Research associate* at the IMATI - CNR, Pavia, Italy.
- October 2013 - February 29, 2016: *Head of research group Entropy Formulation of Evolutionary Phase Transitions* at the Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany.
- November 2010 - February 29, 2016: *Associate Professor* at the Department of Mathematics of the University of Milan, Italy, on leave since October 1st, 2013.
- January 2004 - October 2010: *Researcher* (permanent) at the Department of Mathematics of the University of Milan, Italy.
- June - December 2003: *postdoc* position (assegno di ricerca) University of Pavia, Italy, under the supervision of Prof. Gianni Gilardi.

## HONORS AND AWARDS

- Coordinator of a local Unit of the PRIN Project Mathematics for industry 4.0 (Math4I4) funded for 150.000 € (2021-2024)
- Call to a Full Professor Position (W3s) for Applied Analysis at the Humboldt University and jointly at the WIAS, Berlin 2018 (declined).
- Invited speaker at the 7th European Congress of Mathematics, Berlin, July 18 - 22, 2016.
- Qualified as Full Professor at the National Scientific Qualification in Italy (*Professore Ordinario*) (Validity: 30/12/2013 – 14/11/2020).
- *Junior ISIMM Price 2014*, from the International Society for the Interaction of Mechanics and Mathematics (ISIMM) on November 12, 2013.
- *Principal Investigator* of the Project **ERC Starting Independent Research Grant 2010** “Entropy formulation of evolutionary phase transitions - EntroPhase”, April 1st 2011 – March 31, 2017. Funded for € 659.784,88.
- *Junior researcher* at the *Necas Center for Mathematical Modelling* - From October 22, 2007 till November 22, 2007 - Prague, Czech Republic.
- SAFI - IUSS prizes in 2001 and 2002.
- “Luigi Berzolari” price for the best Thesis in Mathematics of at the University of Pavia of September 1998 - August 1999.

## VISIT AND RESEARCH EXPERIENCES

For periods going from one to four weeks

- 2019: Basque Centre for Applied Mathematics, Bilbao (Spain).
- 2019: University of Poitiers (France).
- 2018: Gheorghe Mihoc-Caius Iacob Institute of Mathematical Statistics and Applied Mathematics, Bucharest (Romania).
- 2016: Erwin Schroedinger International Institute - ESI, Vienna (Austria).
- 2015: Durham University (UK).
- 2013: Fudan University, Shanghai, (China).
- 2012: Mathematical Department of the University of Bath (UK).
- 2008-09-24: Mathematical Institute of the Academy of Sciences, Prague (Czech Republic).
- 2007: Junior researcher at the *Necas Center for Mathematical Modelling*, Prague (Czech Republic).
- From 2004 to 2017: at the “Wierstrass Institute for Applied Mathematics and Stochastics” - WIAS, Berlin (Germany).
- 2003: “Laboratoire Central des Ponts et Chaussées”, Paris (France).

#### COORDINATION AND PARTICIPATION TO RESEARCH PROJECTS

- ◇ **Coordinator** of a local Unit of the PRIN Project Mathematics for industry 4.0 (Math4I4) funded for 150.000 € (2021-2024).
- ◇ **Principal Investigator** of the Project ERC Starting Independent Research Grant 2010 “Entropy formulation of evolutionary phase transitions - EntroPhase”, April 1st 2011–March 31, 2017 Funded for € 659.784,88, with three PostDocs hired on the Project.
- ◇ **Scientific Coordinator** of the Fondazione Cariplo-Regione Lombardia project MEGASTAR “Matematica d’Eccellenza in biologia ed ingegneria come acceleratore di una nuova strategia per l’ATTività dell’ateneo pavese”, October 2016–March 2020. Funded for € 200.000.
- ◇ **Scientific coordinator** of the italian part of the Romanian-Italian project: “Analysis and Optimization of mathematical models ranging from bio-medicine to engineering” funded for three years: 2020-23.
- ◇ MIUR (FFABR) “Fondo per il finanziamento delle attività base di ricerca” (2018).
- ◇ **Coordinator** of the Italian Project Gnampa 2010 *Analisi di modelli ad interfaccia diffusa di fluidi interagenti*.
- ◇ **Coordinator** of the Italian Project Pur 09 *Analisi matematica e stocastica di modelli applicativi*, at the l’Università degli Studi di Milano.

- Participant to the Romanian-Italian project: “Equazioni alle derivate parziali (EDP) non lineari con applicazioni a modelli di crescita delle cellule, chemotassi e transizione di fase” funded two times: for three years: 2023-26, 2017-20 and 2014-16 from CNR and RA.
- Participant to the Italian Project Prin 08 *Problemi inversi per equazioni di evoluzione*, coordinated by Giovanni Alessandrini.
- Participant to the Italian Project Gnampa 2009 *Analisi matematica di formulazioni energetiche ed entropiche per problemi non-smooth in termomeccanica*, coordinated by Elena Bonetti.
- Participant to the Project 2008 *Modelli matematici in scienza dei materiali Modèles mathématiques en science des matériaux*, in the framework of the Program Galileo of scientific cooperation Italia-Francia, coordinated by Giulio Schimperna (coordinator of the french part: Alain Miranville, University of Poitiers).
- Participant to the Italian Project Gnampa 2008 *Equazioni di evoluzione nelle scienze dei materiali come sistemi dinamici infinito-dimensionali*, coordinated by Giulio Schimperna.
- Participant to the Italian Project Prin 04 “Problemi di identificazione per equazioni e sistemi di evoluzione differenziali ed integrodifferenziali, lineari e non lineari ”, coordinated by Giovanni Alessandrini.

## ORGANIZING EXPERIENCES

Co-organizer of the events:

1. Giornata INDAM “Cahn–Hilliard and Allen–Cahn equations in bio-medicine (BIO-MED)”, Politecnico of Milan, February 22, 2024.
2. XXII Congresso UMI, Sezione Speciale SS6 – Problemi diretti e inversi in scienza dei materiali, biomedicina e climatologia, Pisa, September 4–6, 2023.
3. Como Lake School, Mathematical Models for Bio-Medical Sciences Como, 20-24 June, 2022.
4. INDAM Workshop Phase field Methods in applied sciences – PHAME2022, Rome, May 23-27, 2022.
5. Oberwolfach Workshop: “Challenges in Optimization with Complex PDE-Systems”, February 14-20, 2021, ONLINE.
6. International Workshop: “Recent advances in Phase-Field modeling: from Engineering to Biology”, May 8-10, 2019.
7. Special Session SS 144 entitled “Analytic properties and numerical approximation of differential models arising in applications”, within the 12th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Taipei, Taiwan, July 5-9, 2018.
8. Workshop “Special Materials and Complex Systems – SMACS 2018”, June 18-22, 2018, Palazzo Feltrinelli, Gargnano, Italy.

9. Workshop on “Challenges in Optimal Control of Nonlinear PDE-Systems”, April 8-18, 2018, Oberwolfach, Germany.
10. Workshop: “Analysis of Boundary Value Problems for PDEs. An afternoon in honor of Gianni Gilardi on the occasion of his 70th birthday”, Pavia, February 20, 2017.
11. “Special Afternoon on Diffuse Interface Models and Related Problems”, IMATI-CNR, Pavia, February 7, 2017.
12. INDAM-ISIMM Workshop Trends on Applications of Mathematics to Mechanics, Rome, September 5-9, 2016.
13. Special Session “Control and Asymptotics of Nonlinear PDE Dynamics” of the “First Joint Meeting Brazil-Italy in Mathematics”, Rio de Janeiro, August 29-September 2, 2016.
14. Indam Meeting - OCERTO 2016 - Optimal Control for Evolutionary PDEs and Related Topics, Palazzone, Cortona - Italy, June 20-24, 2016.
15. ERC Workshop - MoMatFlu - Modeling materials and fluids using variational methods, WIAS - Berlin, February 22-26, 2016.
16. Perspectives in Applied PDEs: a day in Pavia, February 9, 2016.
17. Workshop PDE2015 - Theory and Applications of Partial Differential Equations, WIAS - Berlin, November 30-December 4, 2015.
18. CIME Course on “Mathematical Thermodynamics of complex fluids”, Cetraro - Italy, June 29-July 3, 2015.
19. Indam-ERC Workshop “Special materials in complex systems”, INDAM, Rome - May 18-22, 2015.
20. Special Session *Applied analysis* of the GAMM 86th Annual Scientific Conference, Lecce, March 23-27, 2015.
21. Special Session “*Variational energy and entropy approaches in non-smooth thermomechanics*” of the 10th-AIMS Conference on Dynamical Systems, Differential Equations and Applications, Madrid, July 07–11, 2014.
22. RIPE60 – *Rate Independent Processes and Evolution – Workshop on the occasion of Pavel Krejci 60th birthday*, Mathematical Institute of the Czech Academy of Sciences, Prague, June 24–26, 2014.
23. *International Conference: “Two Days Workshop on LC-flows”*, IMATI, CNR, Pavia, March 24-25, 2014.
24. *CIRM-ERC Workshop “DIMO-2013” Diffuse Interface Models*, Levico Terme - Italy, September 10-13, 2013.
25. Minisymposium MS13: *Coupled Variants of the Cahn-Hilliard Equation* of the Equadiff Conference, 2013, Prague, August 25-31, 2013.
26. *International School on “Recent advances in partial differential equations and applications”*, Università degli Studi di Milano, Milan, June 17-22, 2013.

27. *Spring School on "Rate-independent evolutions and hysteresis modelling"* , Università degli Studi di Milano, Milan, May 27-31, 2013.
28. Workshop *PDEs for multiphase advanced materials - ADMAT2012*, Cortona - Italy, September 17-21, 2012.
29. Workshop INDI2011 *Interfaces and discontinuities in Solids, Liquids and Crystals*, Gargnano - Italy, June 20-23, 2011.
30. Meeting on *Direct, Inverse and Control Problems for PDE's (DICOP)*, Cortona - Italy, September 22-26, 2008.
31. Workshop *Direct, Inverse and Control Problems for PDE's (DICOP)*, Rome, June 25-28, 2007.
32. Workshop "Inverse and Control Problems for PDE's (ICOP)", Rome, March 13-16, 2006.
33. Meeting on "Inverse and Direct Problems", Cortona, - Italy, June 20-24, 2005.

#### THESES SUPERVISION, POST-DOCS SUPERVISION, AND PHD PROGRAMMES

- Coordinator of three Master Thesis in Mathematics at the University of Milan:
  - 2010. Manuela Girotti. Title: *"Time relaxation of a phase-field model with entropy balance"*. Mark: 110/110 and honors. Presently: Post-doctoral Fellow at Colorado State University.
  - 2011. Luisa Marini. Title: *"Buona positura e comportamento per tempi lunghi di un'equazione di Allen-Cahn iperbolica con condizione al bordo dinamica"*. Mark: 110/110.
  - 2014. Stefano Melchionna. Title: *"L'equazione di Cahn-Hilliard nonlocale con reazione: esistenza, unicità e regolarità"*. Mark: 110/110 and honors. Presently: PhD student at the University of Vienna.

and of two Degree Theses (in a.y. 2008/2009) at the University of Milan.

- ◇ Presently supervisor of **two PhD students in Pavia**: Matteo Fornoni (with C.Cavaterra) and Giulia Cavalleri (with P.Colli). Supervisor of **six post-docs** from 2011 till now: Michela Eleuteri (2012/2013, presently full prof. at the University of Modena), Sergio Frigeri 2011/2015, Riccardo Scala (May 2015–August 2016, presently researcher A at the University of Siena), Andrea Giorgini (September 2017 - December 2018, presently Chapman Fellow in Mathematics all'Imperial College, London), Carlo Orrieri (December 2018 - March 2019, presently researcher B at the University of Pavia), and Tania Biswas (August 2019 - October 2020, presently researcher at the Indian Institute of Science Education and Research), Andrea Aspri (October 2020 / December 202, presently researcher A at the University of Milano).
- ◇ Member of the BMS (Berlin Mathematical School) in Berlin since 2014.
- ◇ Member of the PhD programme in Mathematics of the University of Milan since 2010.

## INSTITUTIONAL RESPONSIBILITIES, MEMBERSHIP OF SCIENTIFIC SOCIETIES AND COMMISSIONS OF TRUST

- ◇ Delegate of the Rector of the University of Pavia at the teaching activities since October 2019. President of the CPS (Student Commission “Commissione Permanente Studenti”). Representative of the Rector at the CSU (“Comitato Sportivo Universitario”) and at the CUS. Vice-director of the COR (Centro Orientamento Universitario).
- ◇ Member of the Executive Committee of ISIMM – The International Society for the Interaction of Mechanics and Mathematics.
- ◇ Member of the Scientific Societies: GAMM, ISIMM, SIMAI, Gnampa of INDAM, UMI – Unione matematica italiana.
- ◇ 2017 – Member of the Scientific Commission of “INROAd”: a commission encouraging new applications for ERC and Horizon call at the University of Pavia.
- ◇ 2004 – 2016 Faculty member of the University of Milan.
- ◇ 2014 – Member of the Scientific Board of the BMS (Berlin Mathematical School), Berlin.
- ◇ 2010 – Member of the PhD Board of the Mathematical Department, University of Milan.
- ◇ 2011–2013 co-Organizer of the “Seminari di Dipartimento” and Member of the “Giunta di Dipartimento” (2012) at the Mathematical Department of the University of Milan.
- ◇ 2014– Reviewer/Evaluator for the Italian Funds: “Futuro in Ricerca” and SIR and for the CONICYT - Chilean Commission for Scientific and Technological Research.
- ◇ 2019– Member of several commissions for recruitment of associate and full professors, as well as researchers in Italy and PhD commissions in Germany.

## EDITORIAL AND REFEREE EXPERIENCES

- ◇ **Editor** of the Journal Applied Mathematics & Optimization (from 2018).
- ◇ **Editor** of five special volumes of the international journals Discrete Contin. Dyn. Syst. Ser. S (2011, 2013, 2015, 2023), Discrete Contin. Dyn. Syst. (2015).
- ◇ **Reviewer/Evaluator** for the Italian Funds: “Futuro in Ricerca” and SIR and for the CONICYT - Chilean Commission for Scientific and Technological Research.
- ◇ **Referee** (among the others) for the Journals: Advances in Differential Equations, Advances in Mathematical Sciences and Applications, Advances in Nonlinear Analysis, Annali di Matematica Pura ed Applicata, Banach Center Publications, Communications on Pure and Applied Analysis, Differential and Integral Equations, Discrete and Continuous Dynamical Systems, International Journal of Differential Equations, Journal of Differential Equations, Journal of Evolution Equations, Mathematical Methods in the Applied Science, Mathematical Modelling and Numerical Analysis, Nonlinear Analysis: Modelling and Control, Nonlinear Analysis Series A: Theory, Methods & Applications, SIAM Journal on Control and Optimization, SIAM Journal on Mathematical Analysis, Zeitschrift fuer Angewandte Mathematik und Physik, *Reviewer* for Mathematical Reviews

## INVITED SEMINARS 2010-2024

- April 2024, Lecturer of the Course “Cahn-Hilliard and Allen-Cahn-type Phase-field Models Coupled with Viscoelasticity” at the Spring School: Mathematical Advances for Complex Materials with Microstructures, Würzburg, Germany.
- February 1st, 2022: *Optimal control and log-time behavior of diffuse interface models of tumor growth*, Würzburger Mathematische Kolloquium (ONLINE).
- September 20-22, 2021: *Optimal control problems in engineering and biology*, Minicourse at the Young Women in PDEs and Applications University of Bonn (ONLINE).
- April 12-16, 2021: *Optimal control and topology optimization in Engineering and Biology*, 5 lessons at the Course OPTIMIZATION OF SHAPE AND MATERIAL PROPERTIES: ADVANCED MATHEMATICAL METHODS AND 3D PRINTING, CISM, Udine (ONLINE).
- November 27, 2020: *Recent topics in the modeling and analysis of diffuse interface tumor growth*, BMS – Math+ Friday Colloquium – Berlin (ONLINE).
- May 20-24, 2019, (CICLO DI LEZIONI) *Recent topics in the modeling and analysis of diffuse interface tumor growth*, NSF-CBMS Conference on THE CAHN-HILLIARD EQUATION: RECENT ADVANCES AND APPLICATIONS, Montgomery Bell State Park.
- April 10, 2019: *Problemi di controllo ottimo con applicazioni in Biologia e Ingegneria*, lesson for the students of the University of Udine.
- March 25, 2019: *Long-time dynamics and optimal control for some tumor growth models*, Università di Roma La Sapienza, Roma.
- October 26, 2018: *Phase-field Models for Biological Systems, Complex Fluids, and Special Materials*, Opening Colloquium PhD programme, University of Regensburg, Germany.
- June 28, 2018: *Optimal control of treatment time in a diffuse interface model of tumor growth and related issues*, MOX, Milano Politecnico.
- May 4, 2017: *Optimal Control in Diffuse Interface Models of Tumor Growth*, WIAS, Berlin, Germany.
- January 25, 2017: *ERC Candidate@Unipv: esperienze a confronto e progettazione futura*, Pavia.
- October 27, 2015: *Existence of weak solutions and asymptotics for some diffuse interface models of tumor growth*, WIAS, Berlin, Germany.
- March 13, 2015: *Optimal control of a nonlocal convective Cahn-Hilliard equation by the velocity*, Durham University, UK.
- January 27, 2014: *Entropic solutions for systems of PDEs arising in complex fluids dynamics*, WIAS Colloquium, WIAS, Berlino, Germany.
- January 30, 2013: *Weak formulation of a nonlinear PDE system arising from models of phase transitions and damage*, University of Milano Bicocca, Italy.



- December 4, 2012: *Weak solutions for a degenerating PDE system for phase transitions and damage*, University of Bath, UK.
- May 15, 2012: *Recent results on the evolution of liquid crystals flows*, WIAS, Berlin.
- February 8, 2011: *On a quasilinear multi-phase system with nonconstant specific heat and heat conductivity*, WIAS, Berlin.
- November 16, 2010: *On a non-isothermal model for nematic liquid crystals*, WIAS, Berlin.
- October 27, 2010: *A diffuse interface model for two phase compressible fluids*, al “Langenbach-Seminar”, WIAS, Berlin.

#### INVITED LECTURES TO INTERNATIONAL CONFERENCES 2010-2024

- March 1st, 2024: *Asymptotics and optimal control for a Cahn-Hilliard-Reaction-Diffusion model for tumor growth*, at the Conference on BIO-PDE Days in Vienna.
- October 13, 2023: *A Cahn-Hilliard phase field model coupled to an Allen-Cahn model of viscoelasticity at large strains*, Variational & Geometric Workshop, Levico Terme Levico Terme, Italy.
- September 8, 2023: *Analisi di modelli ad interfaccia diffusa per dinamiche tumorali*, XXII CONGRESSO DELL'UNIONE MATEMATICA ITALIANA Sessione Speciale SS2 “Matematica per le Scienze della Vita”, Pisa, Italy.
- September 28, 2023: *A phase-field prostate cancer growth with chemotherapy and antiangiogenic therapy effects*, ACDSDE - Analysis & Control of Deterministic and Stochastic Differential Equations in Iasi, Romania.
- June 17, 2022: *Identification of cavities and inclusions in linear elasticity with a phase-field approach*, Theoretical and numerical trends in inverse problems and control for PDE's, and Hamilton-Jacobi equation: French-Italian-Japanese conference CIRM - Marseille (ONLINE).
- June 7, 2022: *A Cahn-Hilliard-Keller-Segel model with generalized logistic source describing tumor growth*, The 81st Fujihara Seminar Mathematical Aspects for Interfaces and Free Boundaries Preconference ONLINE.
- April 25, 2022: *Nonlinear electrokinetics in nematic electrolytes*, Analysis of Nematic Liquid Crystals Flows CIRM, Luminy (ONLINE).
- September 13, 2021: *A PHASE-FIELD PROSTATE CANCER GROWTH WITH CHEMOTHERAPY AND ANTIANGIOGENIC THERAPY EFFECTS*, FBP Conference Virtually in Berlin (ONLINE).
- July 1, 2021: *Optimal control and log-time behavior of diffuse interface models of tumor growth*, INdAM Workshop 2021 Analysis and Numerics of Design, Control and Inverse Problems, Rome and ONLINE.
- April 13, 2021: *A Phase-Field-Based Graded Material Topology Optimization with Stress Constraint*, Plenary talk at the ECMI 2021 Conference (ONLINE).

- February 10, 2021: *Recent results on Additive Manufacturing Graded-material Design based on Phase-field and Topology Optimization*, INdAM WORKSHOP "Mathematical Methods for Objects Reconstruction: from 3D Vision to 3D Printing", ONLINE.
- September 16, 2019: *Recent results on Additive Manufacturing Graded-material Design based on Phase-field and Topology Optimization Dynamics*, Equations and Applications, AGH University of Science and Technology, Kraków, Poland.
- June 25, 2019: *Diffuse interface models of tumor growth*, 39th Congress of the French Theoretical Biology Society, Poitiers, France.
- May 20-24, 2019: *Recent topics in the modeling and analysis of diffuse interface tumor growth*, NSF-CBMS Conference on THE CAHN-HILLIARD EQUATION: RECENT ADVANCES AND APPLICATIONS, Montgomery Bell State Park, USA.
- April 11, 2019: *On a sliding mode control for a tumor growth problem*, ITALIAN-ROMANIAN COLLOQUIUM ON DIFFERENTIAL EQUATIONS AND APPLICATIONS, Udine, Italy.
- March 25, 2019: *Recent results on Additive Manufacturing Graded-material Design based on Phase-field and Topology Optimization*, INdAM Workshop on Mathematical modeling and Analysis of degradation and restoration in Cultural Heritage Roma.
- February 27, 2019: *On the long time behavior and optimal control of a tumor growth model*, BILBAO WORKSHOP ON THEORETICAL FLUID DYNAMICS, BCAM, Bilbao, Spain.
- February 19, 2019: *On the long time behavior of a tumor growth model*, Applied Analysis Session of the Gamm 2019, Vienna, Austria.
- January 22, 2019: *Long-time Dynamics and Optimal Control of Diffuse Interface Models for Tumor Growth*, Workshop on Surface, Bulk, and Geometric Partial Differential Equations: Interfacial, stochastic, non-local and discrete structures, Oberwolfach, Germany.
- November 6, 2018 *A rate-independent gradient system in damage coupled with plasticity via structured strains*, Women in Mathematical Materials Science, University of Regensburg, Germany.
- July 4, 2018: *On a multi-species Cahn-Hilliard-Darcy tumor growth model*, Workshop Asymptotic approach to spatial and dynamical organizations, Paris, France.
- May 8, 2018: *On a hyperbolic system arising in liquid crystals modeling*, Workshop on Mathematical Fluid Dynamics Bad Boll, Germany.
- April 5, 2018: *Dissipative solutions for a hyperbolic system arising in liquid crystals modeling*, Workshop on Differential Equations Central European University, Budapest.
- December 19, 2017: *Diffuse interface models for multiphase tumor growth*, Prague Compressible Meeting, Institute of Mathematics of the Academy of Sciences of the Czech Republic, Prague, Czech Republic.
- December 5, 2017: *Diffuse interface models of tumor growth: optimal control and other issues*, First meeting of the French-German-Italian LIA COPDESC on Applied Analysis, Paris, France.

- August 1, 2017: *Entropic solutions arising in complex fluids dynamics and damage phenomena*, Implicitly constituted materials: Modeling, Analysis and Computing, Roztoky, Czech Republic.
- June 27, 2017: *Optimal control in diffuse interface models of tumor growth*, 37ème Colloque de la Société Francophone de Biologie Théorique, Poitiers, France.
- March 7, 2017: *Diffuse interface models in Biology*, Annual Meeting of GAMM - Contributed Session: Applied Analysis, Weimar, Germany.
- October 13, 2016: *On some diffuse interface models of multispecies tumor growth*, Eleventh Workshop on Mathematical Modelling of Environmental and Life Sciences Problems, Constanta, Romania.
- September 14, 2016: *Diffuse and sharp interfaces in Biology and Mechanics*, SIMAI 2016, Milan Politecnico.
- July 18, 2016: *Diffuse interface models in Biology and Mechanics*, 7th European Congress of Mathematics, Berlin, Germany.
- September 22, 2015: *On some diffuse interface models of tumour growth*, Mini Symposium "Mathematics of fluid interfaces", DMV, Hamburg, Germany.
- April 13, 2015: *Choosing the velocity as control in a nonlocal convective Cahn-Hilliard equation*, Workshop on "Control Theory and related topics", Politecnico of Milano, Italy.
- September 9, 2014: *"Entropic" solutions to a thermodynamically consistent PDE system for phase transitions and damage*, at the STAMM 2014 Meeting, Poitiers, France.
- February 26, 2014: *Non-isothermal two phase flows of incompressible fluids*, at the DFG-CNRS Workshop Two-Phase Fluid Flows. Modeling, Analysis, and Computational Methods, Paris, France.
- October 11, 2013: *On a non-isothermal diffuse interface model for two phase flows of incompressible fluids*, at the ERC-Workshop on Energy/Entropy-Driven Systems and Applications, Berlin, Germany.
- August 27, 2013: *A Nonlocal Model  $H$  with Nonconstant Mobility*, at the Minisymposium MS13: Coupled Variants of the Cahn-Hilliard Equation of the Equadiff Conference, 2013, Prague, Czech Republic.
- June 29, 2013: *Solutions to a full model for thermoviscoelastic material*, al Joint International Meeting of the American Mathematical Society and the Romanian Mathematical Society, Alba Iulia (Romania).
- May 14, 2013: *Optimal control of multifrequency induction hardening*, at the IFIP TC 7.2 Workshop Electromagnetics "Modelling, Simulation, Control and Industrial Applications", WIAS (Germany).
- March 27, 2013: *Existence and long-time dynamics of a nonlocal Cahn-Hilliard-Navier-Stokes system with nonconstant mobility* at the Oberwolfach Workshop "Interfaces and Free Boundaries: Analysis, Control and Simulation", Oberwolfach (Germany).

- September 10 , 2012: *A degenerating PDE system for phase transitions and damage: global existence of weak solutions*, at the Congress “Variational Models and Methods for Evolution”, Levico, Trento (Italy).
- July 1, 2012: *Degenerating PDE system for phase transitions and damage*, alla “9th AIMS Conference on Dynamical Systems, Differential Equations and Applications”, Orlando, Florida (USA).
- July 5, 2012: *Evolution of non-isothermal nematic liquid crystals flows*, alla “9th AIMS Conference on Dynamical Systems, Differential Equations and Applications”, Orlando, Florida (USA).
- June 15, 2012: *Weak formulations of PDEs in thermomechanics*, PLENARY SPEAKER alla “12th International Conference on Free Boundary Problems Theory and Applications”, Chiemsee (Germania).
- April 19, 2012: *Weak formulation of a degenerating PDE system for phase transitions and damage*, at the Congress MathProSpeM2012, Roma (Italy).
- September 14, 2011: *Analysis of a non-isothermal model for nematic liquid crystals*, at the 25th IFIP TC 7 Conference 2011 - System Modeling and Optimization, Berlin.
- December 18, 2010: *A non-isothermal model for nematic liquid crystals*, at the “Workshop on the occasion of 5th anniversary of the foundation of Jindrich Necas Center for Mathematical Modeling”, Prague.
- September 4, 2010: *Degenerating PDE’s for phase transistons in thermoviscoelastic materials*, at the Congress “PDE’s, semigroup theory and inverse problems”, Bologna.
- May 27, 2010: *Liquid-solid phase transitions in a deformable container*, at the “8th AIMS International Conference on Dyn. Systems, Diff. Equations and Applications”, Dresden.

## PUBLICATIONS

Co-author of more than 100 papers. Co-editor of 11 international volumes published on international journals.

Cited more than 1600 times by more than 700 authors. Co-author of more than 50 researchers. H-index 15 according to Scopus and 30 according to Google Scholar.

## PUBLISHED PAPERS ON INTERNATIONAL JOURNALS

1. E. ROCCA: *Asymptotic Analysis of a conserved Phase-Field Model with memory for vanishing time relaxation*, Adv. Math. Sci. Appl., **10** (2000), 899–916.
2. E. ROCCA: *The Conserved Penrose-Fife Phase Field Model with Special Heat Flux Laws and Memory Effects*, J. Integral Equations Appl., **14** (2002), 425–466.
3. G. GILARDI, E. ROCCA: *Su un modello conservativo di tipo Penrose-Fife con condizioni di Neumann*, Istituto Lombardo (Rend. Sc.) A, **136-137** (2002–2003).
4. E. ROCCA, G. SCHIMPERNA: *The Conserved Penrose-Fife system with Fourier heat flux law*, Nonlinear Anal., **53** (2003), 1089–1100.

5. E. ROCCA, G. SCHIMPERNA: *Singular Limits of a Conserved Penrose-Fife phase field Model with special Heat Flux laws and Memory effects*, *Asymptot. Anal.*, **36** (2003), 285–301.
6. E. ROCCA: *The Conserved Penrose-Fife System with Temperature-dependent Memory*, *J. Math. Anal. Appl.*, **287** (2003), 177–199.
7. E. ROCCA: *Existence and uniqueness for the parabolic conserved phase field model with memory*, *Commun. Appl. Anal.*, **8** (2004), 27–46.
8. P. COLLI, G. GILARDI, E. ROCCA, G. SCHIMPERNA: *On a Penrose-Fife phase-field model with non-homogeneous Neumann boundary condition for the temperature*, *Differential Integral Equations*, **17** (2004), 511–534.
9. E. ROCCA, G. SCHIMPERNA: *Universal attractor for some singular phase transition systems*, *Physica D*, **192** (2004), 279–307.
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#### OTHER PUBLICATIONS

N. E. ROCCA: “*Entropic*” *solutions for two-phase fluids flows, phase transitions, and damage*, ISIMM – The International Society for the Interaction of Mechanics and Mathematics – FORUM, March 2015.

#### GRADUATE TEACHING AND PHD COURSES

- April 2024, Lecturer of the Course “Cahn-Hilliard and Allen-Cahn-type Phase-field Models Coupled with Viscoelasticity” at the Spring School: Mathematical Advances for Complex Materials with Microstructures, Würzburg, Germany.

- 2023-24, 2022-23, 2021-22, 2020-21, 2019-20, 2018-2019, 2017-18, 2016-17: Responsible of the course: Advanced Mathematical Methods for Engineering, Advanced Course in English for the CdL in Electronic Engineering, University of Pavia.
- 2010-12, 2015-2016, 2023-24: Responsible of the course: Equazioni di Evoluzione (Evolution Equations), CdL in Matematica, University of Pavia (Advanced Analysis course for students in Mathematics).
- April 12-16, 2021: *Optimal control and topology optimization in Engineering and Biology*, 5 lessons at the Course OPTIMIZATION OF SHAPE AND MATERIAL PROPERTIES: ADVANCED MATHEMATICAL METHODS AND 3D PRINTING, CISM, Udine (ON-LINE).
- March-June 2018: PhD Course at the University of Pavia: The Cahn-Hilliard equation with applications to Biology, joint with Alain Miranville (Poitiers).
- 2008-2010: Responsible of the course: Equazioni alle derivate parziali II (PDE II), PhD in Mathematics, CdL in Matematica, University of Milan (Advanced Analysis course for PhD students and students in Mathematics).

#### UNDERGRADUATE TEACHING

- 2022-23, 2021-22, 2020-21, 2019-2020, 2018-2019: Responsible of the course: Analisi Matematica A, CdL in Ingegneria Civile ed Ambientale ed Edile Architettura, University of Pavia (Analysis course for Engineering).
- 2017-2018: Responsible of the course: Analisi Matematica A, CdL in Ingegneria Civile ed Ambientale, University of Pavia (Analysis course for Engineering).
- 2016-2017: Responsible of the course: Matematica con Elementi di Statistica, CdL in Farmacia, University of Pavia (Calculus Course with Elements of Statistics for CdL in Pharmacy).
- 2015-2016: Responsible of the course: Analisi Matematica 2, CdL Ingegneria, University of Milan (Analysis course for Engineering).
- 2011-2013: Responsible of the course: Analisi Matematica 1, CdL Matematica, University of Milan (Analysis course for Mathematics).
- 2008-2011: Responsible of the course: Analisi Matematica 2, CdL Fisica, University of Milan (Analysis course for Physics).
- 2003-2008: Responsible of the course: Istituzioni di Matematiche, CdL Comunicazione Digitale, University of Milan (Calculus for Information Sciences).
- 2007-2008: Assistant of the course: Istituzioni di Matematica, CdL Informatica per Telecomunicazioni, University of Milan (Calculus for Information Sciences).
- 2005-2007: Assistant of the course: Analisi Matematica IV, CdL Matematica, University of Milan (Analysis course for Mathematics).
- 2003-2004: Assistant of the course: Istituzioni di Matematiche, CdL Informatica, University of Milan (Calculus for Information Sciences).
- For the years going from 2000 to 2003: Collaborations to some calculus and advanced calculus courses at the University of Pavia.