

Francesca Marcellini – Curriculum Vitæ

Postdoc at the Department of Mathematics and Applications, University of Milano-Bicocca

[University of Milano-Bicocca](#)

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National Academic Qualification

2017/03/28 - Italian National Academic Qualification as Associate Professor.

Sector: Mathematical Analysis, Statistics and Probability (01/A3).

Education

2006/02/15 - Degree at the University of Firenze.

Title of thesis: “Estimates for Ornstein-Uhlenbeck Differential Equations”.

Advisor: Professor Vincenzo Vespri (University of Firenze).

2009/12/21 - PhD in Mathematics and Application at the University of Milano-Bicocca.

Title of PhD thesis: “Conservation Laws in Gas Dynamics and Traffic Flow”.

Advisor: Professor Rinaldo M. Colombo (University of Brescia).

Prize

National award **INdAM-SIMAI 2012** for young researchers who have distinguished themselves for their contributions in Applied Mathematics.

Publications

1. G. Guerra, F. Marcellini, V. Schleper. Balance Laws with Integrable Unbounded Sources. *SIAM Journal of Mathematical Analysis*, 41: 1164–1189, 2009.
2. R.M. Colombo, F. Marcellini. Smooth and Discontinuous Junctions in the p -system. *Journal of Mathematical Analysis and Applications*, 361: 440-456, 2010.
3. R.M. Colombo, F. Marcellini. Coupling Conditions for the 3×3 Euler System. *Networks and Heterogeneous Media*, 5: 675–690, 2010.
4. R.M. Colombo, F. Marcellini, M. Rascole. A 2-Phase Traffic Model Based on a Speed Bound. *SIAM Journal on Applied Mathematics*, 70: 2652–2666, 2010.
5. F. Marcellini. Leggi di Conservazione nella Dinamica dei Gas e nei Flussi di Traffico. *Matematica nella Società e nella Cultura, UMI*, 3: 47-50, 2010.

6. G. Guerra, M. Herty, F. Marcellini. Modeling and Analysis of Pooled Stepped Chutes. *Networks and Heterogeneous Media*, 6: 665–679, 2011.
7. R.M. Colombo, F. Marcellini. Smooth and Discontinuous Junctions in the p -system and in the 3×3 Euler System. *Riv. Mat. Univ. Parma*, 3: 55-69, 2012.
8. R.M. Colombo, G. Guerra, M. Herty, F. Marcellini. A Hyperbolic Model for the Laser Cutting Process. *Applied Mathematical Modelling*, 37: 7810-7821, 2013.
9. F. Marcellini. Mixed Systems in the Description of Traffic Flow. *Oberwolfach Report*, 29: 37-40, 2013.
10. F. Marcellini. Free-Congested and Micro-Macro Descriptions of Traffic Flow. *Discrete and Continuous Dynamical Systems-Series S-AIMS*, 7: 543-556, 2014.
11. R.M. Colombo, F. Marcellini. A Mixed ODE-PDE Model for Vehicular Traffic. *Mathematical Methods in the Applied Sciences*, 38: 1292-1302, 2015.
12. R.M. Colombo, F. Marcellini. NonLocal Systems of Balance Laws in Several Space Dimensions with Applications to Laser Technology, *Journal of Differential Equations*, 259: 6749-6773, 2015.
13. R.M. Colombo, F. Marcellini. A Traffic Model Aware of Real Time Data, 2015, *Mathematical Models and Methods in Applied Sciences*, 26: 445-467, 2016.
14. R.M. Colombo, F. Marcellini, E. Rossi. Biological and Industrial Models Motivating Nonlocal Conservation Laws: a Review of Analytic and Numerical Results, *Networks and Heterogeneous Media*, 11: 49-67, 2016.
15. F. Marcellini. ODE-PDE Models in Traffic Flow Dynamics, *Bulletin of the Brazilian Mathematical Society, New Series*, 47: 533-544, 2016.
16. F. Marcellini. A Traffic Model with Phase Transitions at a Junction, *Oberwolfach Report*, 13: 1720-1723, 2016.
17. M. Garavello, F. Marcellini. The Riemann Problem at a Junction for a Phase Transition Traffic Model, *Discrete and Continuous Dynamical Systems-Series A-AIMS*, 37: 5191-5209, 2017.
18. F. Marcellini. On the Stability of a Model for the Cutting of Metal Plates by Means of Laser Beams, *Applied Mathematics Letters*, 68: 143-149, 2017.
19. F. Marcellini. Existence of Solutions to a Boundary Value Problem for a Phase Transition Traffic Model, *Networks and Heterogeneous Media*, 12: 259-275, 2017.
20. M. Garavello, F. Marcellini. The Godunov Method for a 2-Phase Model, *Communications in Applied and Industrial Mathematics*, 9: 1-16, 2017.
21. M. Garavello, F. Marcellini. A Riemann Solver at a Junction compatible with a Homogenization Limit. *Journal of Mathematical Analysis and Applications*, 464: 1333-1351, 2018.

Outreach

R.M. Colombo, F. Marcellini. Traffico Veicolare e Dinamica di Pedoni Attraverso le Leggi di Conservazione. *Quaderno 14, Dipartimento di Matematica e Fisica "Respighi"*, Piacenza, 2014.

Research Interests

My research interests focus on partial differential equations. Initially, I dealt with the study of parabolic equations, both from a deterministic and from a stochastic point of view. More recently, I started dealing with hyperbolic equations, in particular with Conservation Laws, their basic theory and their applications. Starting with the study of models concerning fluid dynamics and water flow, I considered also the cutting of metal plates by means of laser beams and, mostly, traffic flow. Modelling needs brought me to consider also mixed systems consisting of conservation/balance laws coupled with ordinary differential equations, also in the presence of constraint.

Coordination of Research Grants

GNAMPA 2018

(national)

Title: Conservation Laws: Hyperbolic Games, Vehicular Traffic and Fluid Dynamics

Coordinator: F. Marcellini.

Research Visits and International Collaborations

France Collaboration with Professor Michel Rascle (University of Nice)

University of Nice, Nice, France, February 2009

Germany Collaboration with Professor Michael Herty (RWTH)

RWTH, Aachen, Germany, July 2010

Germany Collaboration with Professor Michael Herty (RWTH)

RWTH, Aachen, Germany, August-September 2011

Germany Collaboration with Professor Michael Herty (RWTH) and Dr. Markus Nießen (Fraunhofer-ILT)

RWTH, Aachen, Germany, December 2014

USA Research Visit at UCLA, within the *Long Program "New Directions in Mathematical Approaches for Traffic Flow Management"*

UCLA, Los Angeles, Usa, October 2015

Penn State University Collaboration with Professor Alberto Bressan (PSU)

Penn State University, State College, USA, July 2018

Communications at International Conferences

IMA-USA "Nonlinear Conservation Laws and Applications"

Summer Program, IMA, University of Minnesota, Minneapolis, USA, July 2009

(invited)

Sophia Antipolis-France "Traffic Modeling and Management: Trends and Perspectives"

Scientific Talk: *Two-Phase and Micro-Macro Descriptions of Traffic Flow*

INRIA, Sophia Antipolis, France, March 2013

(invited)

Oberwolfach-Germany "Hyperbolic Techniques for Phase Dynamics"

Scientific Talk: *Mixed Systems in the Description of Traffic Flow*

Oberwolfach, Germany, June 2013

(invited)

Rio de Janeiro-Brazil "XV International Conference on Hyperbolic Problems"

Scientific Talk: *Mixed ODE-PDE Models in the Description of Traffic Flow*

Rio de Janeiro, Brazil, July 2014

(selected)

- Los Angeles-USA** “Mathematical Foundations of Traffic” (invited)
 Scientific Talk: *Coupling Different Traffic Models*
 UCLA, Los Angeles, USA, September-October 2015
- Sophia Antipolis-France** “TRAM3 Terminus” (invited)
 Scientific Talk: *Balance Laws: Applications to Traffic Flow and to Laser Technology*
 INRIA, Sophia Antipolis, France, January 2016
- Oberwolfach-Germany** ”Hyperbolic Techniques in Modelling, Analysis and Numerics” (invited)
 Scientific Talk: *A Traffic Model with Phase Transitions at a Junction*
 Oberwolfach, Germany, June 2016
- Rome-Italy** “INdAM: VIII Workshop on the Mathematical Foundations of Traffic” (selected)
 Scientific Talk: *A Phase Transition Traffic Model at Junctions*
 Rome, Italy, INdAM, March 2017
- HYP2018** ”XVII International Conference on Hyperbolic Problems” (selected)
 Scientific Talk: *A 2-Phase Traffic Model in the Description of Traffic*
 State College, USA, June 2018

Other Communications and Seminars

- Meeting SMI** “Partial Differential Equations” (selected)
 Scientific Talk: *Entropy and Stability of Classical Solutions*
 Cortona, Italy, 2007
- Workshop** ”Conservation Laws and Applications” (invited)
 Scientific Talk: *Junctions in Gas Pipelines*
 Brescia, Italy, 2008
- Workshop** “6th Meeting on Hyperbolic Conservation Laws: Recent results and Research perspectives” (selected)
 Scientific Talk: *Smooth and Discontinuous Junctions in the p -system*
 L’Aquila, Italy, 2008
- Workshop** ”Intensive Research Month on Hyperbolic Conservation Laws and Fluid Dynamics (selected)
 Scientific Talk: *Smooth and Discontinuous Junctions in the p -system and in the 3×3 Euler System*
 Parma, Italy, 2010
- Workshop** ”8th Meeting on Hyperbolic Conservation Laws: Recent results and Research perspectives” (selected)
 Scientific Talk: *A 2-Phase Traffic Model Based on a Speed Bound*
 SISSA-ISAS, Trieste, Italy, 2010
- Workshop** ”Consegna Premi INdAM-SIMAI 2012: Prospettive di sviluppo della matematica applicata” (invited)
 Scientific Talk: *Two-Phase and Micro-Macro Descriptions of Traffic Flow*
 Aula Marconi, CNR Roma, Italy, 2013
- Workshop** “10th Meeting on Hyperbolic Conservation Laws: Recent results and Research perspectives” (selected)
 Scientific Talk: *Two-Phase Models in the Description of Traffic Flow*
 L’Aquila, Italy, 2013
- Seminar** ”Seminario di Equazioni Differenziali e Sistemi Dinamici”
 Scientific Talk: *PDEs in the Modeling of Traffic Flows and Laser Cutting*
 Milano-Bicocca 2017

Participation at International and Italian Workshops

“Nonlinear Hyperbolic problems”

Roma, Italy, 2007

“Evolution Equations in Pure and Applied Sciences”

Firenze, Italy, 2008

“Optimal Transportation, Geometry and Functional Inequalities”

Pisa, Italy, 2008

“7th Meeting on Hyperbolic Conservation Laws: Recent results and Research perspectives”

SISSA-ISAS, Trieste, Italy, 2009

“Contemporary Topics in Conservation Laws”

Besancon, France, 2015

IperGSSI2015 ”16th Meeting on Hyperbolic Conservation Laws: Recent results and Research perspectives”

L’Aquila, 2015

”Analysis and Control on Networks: trends and perspectives”

Padova, Italy, 2016

“Meeting on Hyperbolic Conservation Laws: Recent results and Research perspectives. On the occasion of the 60th birthday of Alberto Bressan”

SISSA-ISAS, Trieste, Italy, 2016

Schools and Advanced Courses

“Partial Differential Equations”, (SMI)

Cortona, Italy, 2007

Nonlinear Partial Differential Equations and Applications, (CIME COURSE)

Cetraro, Italy, 2008

“Modelling and Optimisation of Flows on Networks”, (CIME COURSE)

Cetraro, Italy, 2009

“First Winter School at IMEDEA on PDEs and Inequalities”

Madrid, Spain, 2009

Participation to Research Grants

PRIN 2007

(national)

Title: Equazioni della dinamica dei fluidi di tipo iperbolico e leggi di conservazione

Scientific Coordinator: S. Bianchini

Scientific Responsible: P. Secchi

GNAMPA 2009

(national)

Title: Flussi di Traffico di Pedoni

Responsible: M. Garavello

PRIN 2009

(national)

Title: Equazioni della dinamica dei fluidi di tipo iperbolico e leggi di conservazione

Scientific Coordinator: S. Bianchini

Scientific Responsible: P. Secchi

GNAMPA 2010

(national)

Title: Controllo per Leggi di Conservazione

Responsible: M. Garavello

Vigoni 2010	(international)
Title: NonLocal Transport Processes Modeling, Analysis, Numerics and Optimal Control	
Responsibles: R.M Colombo, M. Herty	
GNAMPA 2011	(national)
Title: Controllo per Leggi di Conservazione	
Responsible: M. Garavello	
GNAMPA 2012	(national)
Title: Problemi Misti e NonLocali per Leggi di Bilancio	
Responsible: M. Garavello	
PRIN 2012	(national)
Scientific Coordinator: S. Bianchini	
Scientific responsible: G. Guerra	
GNAMPA 2013	(national)
Title: Conservation Laws: Theory and Applications	
Responsible: R.M. Colombo	
GNAMPA 2014	(national)
Title: Leggi di Conservazione nella Modellizzazione di Dinamiche di Aggregazione	
Responsible: M. Garavello	
GNAMPA 2015	(national)
Title: Balance Laws in the Modeling of Physical, Biological and Industrial Processes	
Responsible: R.M. Colombo	
GNAMPA 2016	(national)
Title: Balance Laws: Theory and Applications	
Responsible: M. Garavello	
GNAMPA 2017	(national)
Title: Conservation Laws: from Theory to Technology	
Responsible: R.M. Colombo	

Organization of Conferences

- IperMiB2013: 15th Italian Meeting on Hyperbolic Equations
University of Milano-Bicocca, Milan, Italy, September 2013
- Minisymposium SIMAI-Analysis and numerics for the modeling through conservation laws
Politecnico di Milano, Milan, Italy, September 2016

Referee Activity

Served as referee for the journals:

- *Discrete and Continuous Dynamical Systems*
- *Journal of Differential Equations*
- *Journal of Hyperbolic Differential Equations*
- *Mathematics and Computers in Simulation*
- *Mathematical Methods in the Applied Sciences*
- *Networks and Heterogeneous Media*

and for the conference

- *Equadiff 13*

Teaching

- Matematica I (a.a. 2012-2013) Materials Science University of Milano-Bicocca Referring Professor: Prof. Leonede De Michele.	Teaching hours: 36 Students: 100 Supervisor of all examinations
- Matematica I (a.a. 2013-2014) Materials Science University of Milano-Bicocca Referring Professor: Prof. Leonede De Michele.	Teaching hours: 36 Students: 200 Supervisor of all examinations
- Matematica I (a.a. 2014-2015) Materials Science University of Milano-Bicocca Referring Professor: Prof. Mauro Garavello.	Teaching hours: 36 Students: 200 Supervisor of all examinations
- Matematica I (a.a. 2015-2016) Materials Science University of Milano-Bicocca Referring Professor: Prof. Mauro Garavello.	Teaching hours: 24 Students: 150 Supervisor of all examinations
- Analisi Matematica I (a.a. 2016-2017) Mathematics and Physics University of Milano-Bicocca Referring Professor: Prof. Sandro Levi	Teaching hours: 48 Tutoring hours: 20 Students: 200 Supervisor of all examinations
- Analisi Matematica I (a.a. 2017-2018) Mathematics and Physics University of Milano-Bicocca Referring Professor: Prof.ssa Veronica Felli	Teaching hours: 48 Tutoring hours: 20 Students: 200 Supervisor of all examinations

Further Information

Excellent knowledge of English.

Representative of PhD students and Postdocs at the University of Milano-Bicocca, 2006-2009 and 2012-2018.

Member SIMAI, GNAMPA.

Direct Links

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