Curriculum Vitae

Raffaele Folino

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Personal Information

- **Birthdate/place:** 21/06/1988, Catanzaro (Italy)
- **Nationality:** Italian
- **E-mail:** folino@aries.iimas.unam.mx, folino@ciencias.unam.mx
- **Languages:** Italian (Mother tongue), English, Spanish

Education and training

- **10/2007 - 12/2010:** Bachelor degree in Mathematics, Sapienza, University of Rome. Final grade: 110/110 cum Laude.
  Thesis: *Equazioni differenziali che modellizzano un'infezione da virus dell'epatite B.*
  Advisor: Prof. Maria Assunta Pozio.
- **10/2010 - 09/2013:** Master degree in Applied Mathematics, Sapienza, University of Rome. Final grade: 110/110 cum Laude.
  Thesis: *Onde viaggianti per equazioni iperboliche di reazione-diffusione.*
  Advisor: Prof. Corrado Mascia.
- **01/2014 - 12/2016:** PhD School, Mathematics and Models, University of L'Aquila (Italy).
  Thesis: *Metastability for hyperbolic variations of Allen–Cahn equation.*
  PhD Defense: March 21, 2017; cum laude.
  Advisors: Prof. Corrado Lattanzio and Prof. Corrado Mascia.

Academic Positions

03/2017 - 02/2019: Post Doc at the Department of Information Engineering, Computer Science and Mathematics, University of L'Aquila.

05/2019 - 08/2019: Visiting Assistant Professor at the Department of Mathematics and Mechanics, Institute of Applied Mathematics and Systems (IIMAS), National Autonomous University of Mexico (UNAM).

09/2019 - 05/2025: Investigador Asociado "C" (Research Assistant Professor) at the Department of Mathematics and Mechanics, Institute of Applied Mathematics and Systems (IIMAS), National Autonomous University of Mexico (UNAM).

05/2025 - today: Investigador Titular "A" (Associate Professor) at the Department of Mathematics and Mechanics, Institute of Applied Mathematics and Systems (IIMAS), National Autonomous University of Mexico (UNAM).

Research area

Partial differential equations (mainly, evolution equations): well-posedness, long-time behavior, stability, nonlinear waves, singular limits.

Awards

- Member of the National Researcher's Network (SNI-CONACyT): Livel I. 2021–2025.
- National Scientific qualification for the disciplinary field of 01/A3 - Mathematical Analysis, Probability and Statistics: Associate Professor. 31/01/2022–31/01/2034.

Publications

1. R. Folino. Slow motion for a hyperbolic variation of Allen–Cahn equation in one space dimension. *J. Hyperbolic Differ. Equ.*, **14** (2017), 1–26.

2. R. Folino, C. Lattanzio, C. Mascia and M. Strani. Metastability for nonlinear convection-diffusion equations. *Nonlinear Differ. Equ. Appl.*, **24** (2017), article 35.

3. R. Folino, C. Lattanzio and C. Mascia. Metastable dynamics for hyperbolic variations of the Allen–Cahn equation. *Commun. Math. Sci.*, **15** (2017), 2055–2085.

4. R. Folino, C. Lattanzio and C. Mascia. Slow dynamics for the hyperbolic Cahn–Hilliard equation in one-space dimension. *Math. Meth. Appl. Sci.*, **42** (2019), 2492–2512.

5. R. Folino. Slow motion for one-dimensional nonlinear damped hyperbolic Allen–Cahn systems. *Electron. J. Differential Equations*, Vol. 2019 (2019), No. 113, pp. 1–21.

6. R. Folino, M. Garrione and M. Strani. Stability properties and dynamics of solutions to viscous conservation laws with mean curvature operator. *J. Evol. Equ.*, **20** (2020), 517–551.

7. R. Folino and M. Strani. On the speed rate of convergence of solutions to conservation laws with nonlinear diffusions. *Nonlinear Analysis*, **196** (2020), article 111762.

8. R. Folino, C. Lattanzio and C. Mascia. Motion of interfaces for a damped hyperbolic Allen–Cahn equation. *Commun. Pure Appl. Anal.*, **19** (2020), 4507–4543.

9. R. Folino, C. A. Hernández Melo, L. Lopez Rios and R. G. Plaza. Exponentially slow motion of interface layers for the one-dimensional Allen–Cahn equation with nonlinear phase-dependent diffusivity. *Z. Angew. Math. Phys.*, **71** (2020), article 132.

10. R. Folino, R. G. Plaza and M. Strani. Metastable patterns for a reaction-diffusion model with mean curvature-type diffusion. *J. Math. Anal. Appl.*, **493** (2021), article 124455.

11. R. Folino, C. Lattanzio and C. Mascia. Metastability and layer dynamics for the hyperbolic relaxation of the Cahn–Hilliard equation. *J. Dyn. Diff. Equat.*, **33** (2021), 75–110.

12. R. Folino. Metastable dynamics for a hyperbolic variant of the mass conserving Allen–Cahn equation in one space dimension. *J. Differential Equations*, **276** (2021), 493–532.

13. R. Folino, R. G. Plaza and M. Strani. Long time dynamics of solutions to p-Laplacian diffusion problems with bistable reaction terms. *Discrete Contin. Dyn. Syst.*, **41** (2021), 3211–3240.

14. R. Folino. Exponentially slow motion for a one-dimensional Allen–Cahn equation with memory. *Rend. Mat. Appl. (7)*, **42** (2021), 253–270.

15. R. Folino, L. Lopez Rios and R. G. Plaza. Long-time behavior of solutions to the generalized Allen–Cahn model with degenerate diffusivity. *Nonlinear Differ. Equ. Appl.*, **29** (2022), article 45.

16. R. Folino, L. Lopez Rios and M. Strani. On a generalized Cahn–Hilliard model with p-Laplacian. *Adv. Differential Equations*, **27** (2022), 647–682.

17. R. Folino, R. G. Plaza and D. Zhelyazov. Spectral stability of small-amplitude dispersive shocks in quantum hydrodynamics with viscosity. *Commun. Pure Appl. Anal.*, **21** (2022), 4019–4040.

18. R. Folino and M. Strani. On reaction-diffusion models with memory and mean curvature-type diffusion. *J. Math. Anal. Appl.*, **522** (2023), article 127027.

19. R. Folino, R. G. Plaza and D. Zhelyazov. Spectral stability of weak dispersive shock profiles for quantum hydrodynamics with nonlinear viscosity. *J. Differential Equations*, **359** (2023), 330–364.

20. A. De Luca, R. Folino and M. Strani. Layered patterns in reaction-diffusion models with Perona–Malik diffusions. *Milan J. Math.*, **92** (2024), 195–234.

21. R. Folino and C. Lattanzio. Minimization of a Ginzburg–Landau functional with mean curvature operator in 1-D. *Nonlinear Analysis*, **245** (2024), article 113577.

22. R. Folino, A. Naumkina and R. G. Plaza. Instability of periodic waves for the Korteweg–de Vries–Burgers equation with monostable source. *Physica D*, **467** (2024), article 134234.

23. J. A. Butanda Mejía, D. Castañón Quiroz, R. Folino and L. Lopez Rios. Layer dynamics for the Allen–Cahn equation with nonlinear phase-dependent diffusion. *Discrete Contin. Dyn. Syst.*, to appear (2026).

Proceedings

1. R. Folino. Metastability for hyperbolic variations of Allen–Cahn equation. In: Klingenberg C., Westdickenberg M. (eds) *Theory, Numerics and Applications of Hyperbolic Problems I. HYP 2016. Springer Proceedings in Mathematics & Statistics*, vol. 236. Springer, Cham, (2018), 551–563.

2. R. Folino, C. Lattanzio and C. Mascia. Motion of interfaces for hyperbolic variations of the Allen–Cahn equation. In: Alberto Bressan, Marta Lewicka, Dehua Wang, Yuxi Zheng. (eds) *Hyperbolic Problems: Theory, Numerics and Applications. AIMS on Applied Mathematics*, vol. 10, 434–441.

Research Projects

- GNAMPA - INdAM 2015 (participant)
  Title: *Analisi e stabilità per modelli di equazioni alle derivate parziali nella Matematica applicata.*
  Responsible: P. Antonelli.

- GNAMPA - INdAM 2016 (participant)
  Title: *Modelli fluido-dinamici con applicazioni alla fisica, alla biologia e alle scienze sociali.*
  Responsible: S. Fagioli.

- GNAMPA - INdAM 2017 (participant)
  Title: *Analisi di modelli matematici della fisica, della biologia e delle scienze sociali.*
  Responsible: S. Spirito.

- PAPIIT - DGAPA-UNAM 2023 (principal investigator)
  Title: *Analysis and simulation of hyperbolic and parabolic PDEs.*
  DGAPA-UNAM, Program PAPIIT, Grant **IA-102423**. January 2023 - December 2024. €14,500.00 EUR (approx.)

- PAPIIT - DGAPA-UNAM 2025 (principal investigator)
  Title: *Analysis and stability of PDEs in applied mathematics.*
  DGAPA-UNAM, Program PAPIIT, Grant **IN-103425**. January 2025 - December 2027. €21,000.00 EUR (approx.)

Research visits

09/2018: Department of Molecular Sciences and Nanosystems, Ca' Foscari University of Venice (1 week, invited by Prof. Marta Strani).

01/2020: Department of Information Engineering, Computer Science and Mathematics, University of L'Aquila (2 weeks, invited by Prof. Corrado Lattanzio).

10/2022: Department of Information Engineering, Computer Science and Mathematics, University of L'Aquila (2 weeks, invited by Prof. Corrado Lattanzio).

02/2023: Department of Molecular Sciences and Nanosystems, Ca' Foscari University of Venice (10 days, invited by Prof. Marta Strani).

09/2023: Department of Information Engineering, Computer Science and Mathematics, University of L'Aquila (2 weeks, invited by Prof. Corrado Lattanzio).

12/2024: Department of Information Engineering, Computer Science and Mathematics, University of L'Aquila (2 weeks, invited by Prof. Corrado Lattanzio).

Invited Talks and Seminars

1. *Metastability for the hyperbolic Allen–Cahn equation.*
   Mini-School/Workshop on reaction-diffusion problems, University of Milano-Bicocca, June 26-30, 2017.

2. *Slow dynamics for conservation laws with saturating diffusion.*
   Interactive workshop on hyperbolic equations, University of Ferrara, September 10-12, 2018.

3. *Metastability for hyperbolic relaxation of the Allen–Cahn and Cahn–Hilliard equations.*
   Analysis & PDE Seminars, University of Sussex, Brighton, February 18, 2019.

4. *Metastable dynamics for hyperbolic variations of the Allen–Cahn equation.*
   Coloquio de Matemáticas Aplicadas, IIMAS-FENOMEC UNAM, Mexico City, June 19, 2019.

5. *On reaction processes with hyperbolic or saturating diffusion.*
   Seminario de Ecuaciones Diferenciales No Lineales (SEDNOL), Instituto de Matemáticas, UNAM, Mexico City, September 18, 2019.

6. *The hyperbolic relaxation of the mass conserving Allen–Cahn equation in 1D.*
   Session "Conservation laws and hyperbolic PDE's" at AmericasXII, 12th Americas Conference on Differential Equations and Nonlinear Analysis, Mathematics Research Center (CIMAT), Guanajuato (Mexico), December 9-13, 2019.

7. *Slow motion for reaction-diffusion equations with nonlinear (degenerate) diffusion.*
   Department of Information Engineering, Computer Science and Mathematics, University of L'Aquila, Italy, January 9, 2020.

8. *Generalized Allen–Cahn and Cahn–Hilliard equations with p-Laplacian in 1D.*
   Seminario de Ecuaciones Diferenciales No Lineales (SEDNOL), Instituto de Matemáticas, UNAM, Mexico City, October 6, 2022.

9. *Spectral stability of small-amplitude viscous dispersive shocks in quantum hydrodynamics.*
   Department of Information Engineering, Computer Science and Mathematics, University of L'Aquila, Italy, October 19, 2022.

10. *Spectral stability of weak dispersive shocks in quantum hydrodynamics with linear and non-linear viscosity.*
    Department of Molecular Science and Nanosystems, Ca' Foscari University of Venice, Italy, February 22, 2023.

11. *Reaction-diffusion models with Perona–Malik diffusion in 1D.*
    Minisymposium "Nonlinear PDEs: Analysis, Numerics and Applications" at SIAM Annual Meeting Mexico Section, Instituto Tecnológico Autónomo de México (ITAM), Mexico City, June 7-9, 2023.

12. *Metastability and persistence of layered patterns in reaction-diffusion models with p-Laplacian.*
    Minisymposium "Stability and metastability of coherent structures in nonlinear science" at XLIII Dynamics Days Europe, University of Naples Federico II, September 3-8, 2023.

13. *Slow dynamics in reaction-diffusion equations.*
Department of Information Engineering, Computer Science and Mathematics, University of L'Aquila, Italy, December 12, 2024.

14. *Spectral stability of weak dispersive shocks in quantum hydrodynamics with nonlinear viscosity.*
Special Session "Hyperbolic Partial Differential Equations and Applications" at The 14th AIMS Conference, NYU Abu Dhabi, UAE, December 16-20, 2024.

15. *Transition layer structures in reaction-diffusion models with Perona–Malik diffusion.*
Special Session "Propagation Phenomena in Reaction-Diffusion Systems" at The 14th AIMS Conference, NYU Abu Dhabi, UAE, December 16-20, 2024.

16. *Slow motion in one-dimensional reaction-diffusion equations.*
Seminarios PMA 2025, Universidade Estadual de Maringá, Brazil, April 1, 2025.

Contributed Talks

1. *Metastability for a hyperbolic variation of Allen–Cahn equation.*
IperGSSI2015, 16th Italian Meeting on Hyperbolic Equations, GSSI L'Aquila, 22-24 October 2015.

2. *Metastability for hyperbolic variations of Allen–Cahn equation.*
HYP2016, XVI International Conference on Hyperbolic Problems, Theory, Numerics, Applications, Aachen (Germany), August 1-5, 2016.

3. *Metastability for a hyperbolic Cahn–Hilliard equation.*
IperPV2017, XVII Italian Meeting on Hyperbolic Equations, University of Pavia, 6-8 September 2017.

4. *Motion of interfaces for hyperbolic variations of the Allen–Cahn equation.*
HYP2018, XVII International Conference on Hyperbolic Problems, Theory, Numerics, Applications, University Park, Pennsylvania (USA), June 25-29, 2018.

5. *Reaction-diffusion models with p-Laplace operator.*
SIAM Annual Meeting Mexico Section, Centro de Investigación en Ma-

temáticas Aplicadas (CIMA), Universidad Autónoma de Coahuila (Mexico), June 8-10, 2022.

Organization of scientific events

1. Coordinator (with L. Lopez Rios and R. Plaza) of the minisymposium **Nonlinear PDEs: Analysis, Numerics and Applications** for the Conference *"SIAM Annual Meeting Mexico Section"*, Instituto Tecnológico Autónomo de México (ITAM), Mexico City, June 7-9, 2023.
2. Coordinator (with R. Plaza) of the minisymposium **Stability and metastability of coherent structures in nonlinear science** for the Conference *"XLIII Dynamics Days Europe"*, University of Naples Federico II, September 3-8, 2023.
3. Organizer (with A. Bravetti, G. Ramos and R. Romero) of **Coloquio IIMAS 2023**, Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas (IIMAS), Universidad Nacional Autónoma de México (UNAM).

Teaching experiences

- **2014/2015**: Tutor, *Analysis 1*, Bachelor Degree in Mathematics and Bachelor Degree in Physics, University of L'Aquila, italian.
- **2016:** Exercises classes, *Analysis 1*, Bachelor Degree in Mathematics and Bachelor Degree in Physics, University of L'Aquila, italian.
- **2017:** Exercises classes, *Analysis II*, Bachelor Degree in Information Engineering, University of L'Aquila, italian.
- **2017/2018:** Exercises classes, *Mathematical analysis*, Bachelor Degree in Computer Science and Bachelor Degree in Information Engineering, University of L'Aquila, italian.
- **2017/2018**: *Mathematical 0*, Bachelor Degree in Mathematics, University of L'Aquila, italian.
- **2018/2019**: *Mathematical 0*, Bachelor Degree in Mathematics, University of L'Aquila, italian.
- **2019/2020**: *Semigroup theory and Linear Evolution Equations*, Advanced Graduate Course on Differential Equations, UNAM, english.

- **2020/2021**: *Ecuaciones Diferenciales Parciales*, Graduate Program in Mathematical Sciences, UNAM, english.
- **2021/2022**: *Nonlinear Hyperbolic Partial Differential Equations*, Advanced Graduate Course on Differential Equations, UNAM, english.
- **2021/2022**: *Ecuaciones Diferenciales Parciales*, Graduate Program in Mathematical Sciences, UNAM, english.
- **2022/2023**: *Functional Analysis, Sobolev Spaces and Partial Differential Equations*, Advanced Graduate Course on Differential Equations, UNAM, english.
- **2022/2023**: *Existencia de ondas viajeras para ecuaciones de reacción-difusión*, Seminario de Titulación para Matemáticas, UNAM, spanish.
- **2023/2024**: *Ecuaciones Diferenciales Ordinarias*, Graduate Program in Mathematical Sciences, UNAM, english.
- **2023/2024**: *Análisis Matemático I*, Facultad de Ciencias, UNAM, spanish.
- **2024/2025**: *Análisis Matemático II*, Facultad de Ciencias, UNAM, spanish.
- **2024/2025**: *Ecuaciones Diferenciales Ordinarias*, Graduate Program in Mathematical Sciences, UNAM, english.
- **2024/2025**: *Análisis Matemático I*, Facultad de Ciencias, UNAM, spanish.

Theses supervised

Master degree

- Anna Naumkina.
  Title: Existence of periodic wavetrains for the Korteweg–de Vries–Burgers equation with monostable source.
  Graduate Program in Mathematical Sciences, UNAM.
  Date: March 29, 2023.

Bachelor degree

1. Fabián Elizalde Hernández.
   Title: Existencia de ondas viajeras para la ecuación de Fisher–KPP.
   Matemáticas. Facultad de Ciencias, UNAM.
   Date: October 24, 2023.

2. Luis Francisco Aldana Espinoza.
   Title: Existencia de ondas viajeras para ecuaciones de reacción-difusión con reacción de tipo biestable.
   Matemáticas. Facultad de Ciencias, UNAM.
   Date: November 7, 2023.

Commitee for theses

PhD defence

- Enrique Álvarez del Castillo de Pina. Advisor: Prof. Ramón Gabriel Plaza Villegas. Graduate Program in Mathematical Sciences, UNAM. Date: January 31, 2022.

Master degree

- José Manuel Valdovinos Barrera. Advisor: Prof. Ramón Gabriel Plaza Villegas. Graduate Program in Mathematical Sciences, UNAM.
  Date: February 19, 2021.

Bachelor degree

1. Hugo Martínez Ibarra. Advisor: Prof. Luis Fernando López Ríos. Matemáticas. Facultad de Ciencias, UNAM. Date: August 30, 2023.

2. Luis Enrique Pérez Linares. Tutor: Dr. Alberto Saldaña De Fuentes. Matemáticas. Facultad de Ciencias, UNAM. Date: October 31, 2024.

3. Alberto Isaac Estrella Madrigal. Tutor: Dr. Alberto Saldaña De Fuentes. Matemáticas. Facultad de Ciencias, UNAM. Date: February 13, 2025.

Editorial Activity

- Referee for the scientific journals: *Applicable Analysis, Boletín de la Sociedad Matemática Mexicana, Communications on Pure and Applied Analysis, Journal of Mathematical Analysis and Applications, Mathematics in Engineering, Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences, Rendiconti di Matematica e delle sue applicazioni, Zeitschrift für Analysis und ihre Anwendungen.*

- Reviewer for American Mathematical Society (MATHSCINET).