
CONTACT INFORMATION

Institut de Mathématiques de Toulouse,
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RESEARCH INTERESTS

Applied mathematics: partial differential equations and calculus of variations, with a focus on elliptic systems and models arising in physics (liquid crystals, superconductors). Scalar conservation laws.

POSITIONS

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| 2016- | <i>Maître de conférence</i> (associate professor) at Université Toulouse 3 , Toulouse, France. |
| 2015-2016 | Postdoctoral researcher at the Max Planck Institute for Mathematics in the Sciences . |
| 2012-2015 | Teaching Assistant at Ecole Normale Supérieure and Université Lyon 1 , Lyon, France. |
| 2009-2010 | Mathematics teacher at french secondary school Lycée Chateaubriand, Rome, Italy. |

EDUCATION

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| 2022 | Habilitation, Université Toulouse 3 . |
| 2015 | Ph.D., Université de Lyon , France.
Advisor: Petru Mironescu. |
| 2012 | <i>Agrégation externe de Mathématiques</i> (national competitive exam for high school and university teaching, ranked 1st). |
| 2011 | M.Sc. in Mathematics, Ecole Normale Supérieure , Lyon, France. |

GRANTS AND AWARDS

2022-2026	Coordinator of the ANR-JCJC project SING.
2021	CNRS ‘delegation’ at CMM, Santiago de Chile
2020-2021	CNRS ‘International Emerging Actions’ project
2018-2022	Member of the ANR-JCJC project BLADE-JC.
2018-2022	PEDR (award for excellence in research).
2018	CNRS PEPS project.

ORGANIZED EVENTS

2023	ANR SING workshop (Toulouse, France). Trimester Program ‘Mathematics for complex materials’ (Bonn, Germany).
2020	Workshop on singularities in variational models (Toulouse, France).
2019	Thematic semester ‘Calculus of Variations and Probability’ (Toulouse, France)

STUDENTS & POSTDOCS

2024-	Bin Deng, Postdoc, Université Toulouse 3
2023-	Thibault Lacombe, PhD student, Université Toulouse 3

ARTICLES

Submitted

[35] “Optimal Quantitative Stability of the Möbius group of the sphere in all dimensions”, with A. Guerra and K. Zemas.

[34] “A symmetry breaking phenomenon for anisotropic harmonic maps from a 2D annulus into \mathbb{S}^1 ”, with A. Contreras.

[33] “Sharp quantitative stability of the Möbius group among sphere-valued maps in arbitrary dimension”, with A. Guerra and K. Zemas.

Published or accepted

- [32] “Generation of vortices in the Ginzburg-Landau heat flow”, with M. Kowalczyk.
Ann. Inst. H. Poincaré Anal. Non Linéaire, 2023.
- [31] “On Lebesgue points of entropy solutions to the eikonal equation”, with E. Marconi.
Proc. Roy. Soc. Edinburgh Sect. A, 2023.
- [30] “Stability of the vortex in micromagnetics and related models”, with E. Marconi.
Ann. Sc. Norm. Super. Pisa Cl. Sci., 2023.
- [29] “Quantitative rigidity of differential inclusions in two dimensions”, with A. Lorent and G. Peng.
Int. Math. Res. Not. IMRN, 2023.
- [28] “Far-field expansions for harmonic maps and the electrostatics analogy in nematic suspensions”, with S. Alama, L. Bronsard and R. Venkatraman.
J. Nonlinear Sci., 2023.
- [27] “On optimal regularity estimates for finite-entropy solutions of scalar conservation laws”, with A. Lorent and G. Peng.
C. R. Math. Acad. Sci. Paris, 2023.
- [26] “On a generalized Aviles-Giga functional: compactness, zero-energy states, regularity estimates and energy bounds”, with A. Lorent and G. Peng.
Comm. Partial Differential Equations., 2022.
- [25] “Entire vortex solutions of negative degree for the anisotropic Ginzburg-Landau system”, with M. Kowalczyk and P. Smyrnelis.
Arch. Ration. Mech. Anal., 2022.
- [24] “Singular perturbation of manifold-valued maps with anisotropic energy”, with A. Contreras.
Anal. PDE, to appear.
- [23] “Generalized characteristics for finite entropy solutions of Burgers’ equation”, with A. Contreras Hip and E. Marconi.
Nonlinear Anal., 2022.
- [22] “On the stability of radial solutions to an anisotropic Ginzburg-Landau equation”, with A. Zúñiga.
SIAM J. Math. Anal., 2022.
- [21] “Saturn ring defect around a spherical particle immersed in nematic liquid crystal”, with S. Alama, L. Bronsard and D. Golovaty.
Calc. Var. Partial Differential Equations, 2021.
- [20] “On the L^2 stability of shock waves for finite entropy solutions of Burgers”, with A. Contreras Hip.
J. Differential Equations, 2021.
- [19] “Rigidity of a non-elliptic differential inclusion related to the Aviles-Giga conjecture”, with A. Lorent and G. Peng.
Arch. Ration. Mech. Anal., 2020.
- [18] “Global uniform estimate for the modulus of 2D Ginzburg-Landau vortexless solutions with asymptotically infinite boundary energy”, with R. Ignat and M. Kurzke.
SIAM J. Math. Anal., 2020.
- [17] “Optimal Besov differentiability for entropy solutions of the eikonal equation”, with F. Ghiraldin.
Comm. Pure Appl. Math., 2020.
- [16] “Lifting of $\mathbb{R}\mathbb{P}^{d-1}$ -valued maps in BV and applications to uniaxial Q -tensors. With an appendix on an intrinsic BV -energy for manifold-valued maps”, with R. Ignat.
Calc. Var. Partial Differential Equations, 2019.
- [15] “On the convergence of minimizers of singular perturbation functionals”, with A. Contreras and R. Rodiac.
Indiana Univ. Math. J., 2018.

- [14] “Regularity of solutions to scalar conservation laws with a force”, with B. Gess.
Ann. Inst. H. Poincaré Anal. Non Linéaire, 2018.
- [13] “On the regularity of weak solutions to Burgers’ equation with finite entropy production”, with F. Otto.
Calc. Var. Partial Differential Equations, 2018.
- [12] “Spherical particle in nematic liquid crystal under an external field: the Saturn ring regime”, with S. Alama and L. Bronsard.
J. Nonlinear Sci., 2018.
- [11] “Biaxial escape in nematics at low temperature”, with A. Contreras.
J. Funct. Anal., 2017.
- [10] “Minimizers of the Landau-de Gennes energy around a spherical colloid particle”, with S. Alama and L. Bronsard.
Arch. Ration. Mech. Anal., 2016.
- [9] “Analytical description of the Saturn-ring defect in nematic colloids”, with S. Alama and L. Bronsard.
Phys. Rev. E, 2016.
- [8] “Boundary regularity of weakly anchored harmonic maps”, with A. Contreras and R. Rodiac.
C. R. Math. Acad. Sci. Paris, 2015.
- [7] “Vortex structure in p -wave superconductors”, with S. Alama and L. Bronsard.
J. Math. Phys., 2015.
- [6] “Persistence of superconductivity in thin shells behind H_{c1} ”, with A. Contreras.
Commun. Contemp. Math., 2015.
- [5] “Characterization of function spaces via low regularity mollifiers”, with P. Mironescu.
Discrete Contin. Dyn. Syst. A, 2015.
- [4] “Uniaxial symmetry in nematic liquid crystals”.
Ann. Inst. H. Poincaré Anal. Non Linéaire, 2015.
- [3] “Bifurcation analysis in a frustrated nematic cell”.
J. Nonlinear Sci., 2014.
- [2] “Existence of critical points with semi-stiff boundary conditions for singular perturbation problems in simply connected planar domains”, with P. Mironescu.
J. Math. Pures Appl., 2014.
- [1] “Some properties of the nematic radial hedgehog in the Landau–de Gennes theory”.
J. Math. Anal. Appl., 2013.

RECENT INVITED TALKS

Conferences

- 2024 ‘Warsaw meeting in Analysis and PDEs’,
Warsaw, Poland.
- Workshop ‘Calculus of Variations’
Oberwolfach, Germany.
- ‘Mathematical Analysis of Soft Matter’
Banff, Canada.
- ‘Variational Models in Materials Science’
Naples, Italy.
- ‘Differential Inclusions and Continuum Mechanics’
Zürich, Switzerland.

- 2023 ‘Optimal Transport and the Calculus of Variations’
Edinburgh, Scotland.
‘Young researchers in PDEs’
Madrid, Spain.
‘Emerging Trends in Variational Models of Materials’
Montreal, Canada.
- 2022 Workshop ‘Calculus of Variations’
Oberwolfach, Germany.
‘CY days in Nonlinear Analysis’
Cergy, France.
- 2021 ‘LXXXIX Encuentro Anual SOMACHI’
Rancagua, Chile.

Seminars

- 2024 Marseille, Paris-Saclay, Tours, Rome
- 2023 Leipzig
- 2022 Paris 13
- 2021 Santiago de Chile