# Léo Girardin

*Junior CNRS Researcher in biomathematics*

## Education

2026 **HDR (French *Habilitation à diriger des recherches*)**, *Analyses of reaction–diffusion systems for population biology*, Claude Bernard Lyon 1 University, Villeurbanne (France)

2015–2018 **Ph.D of mathematics**, *Propagation phenomena and reaction–diffusion systems for population dynamics in homogeneous or periodic media*, advisors: Grégoire Nadin and Vincent Calvez, Sorbonne University, Paris (France)

2011–2015 ***Normalien* student at *École Normale Supérieure de Cachan***

2014–2015 **Master *Logique, Philosophie, Histoire et Sociologie des sciences* (epistemology)**, *magna cum laude*, Paris Diderot University, Paris (France)

2013–2014 **Master *Mathématiques de la Modélisation* (partial differential equations)**, *summa cum laude*, Pierre and Marie Curie University, Paris (France)

### Supplementary training

2016 **Summer school: PDE and Probability for Life Sciences**, *1 week*, CIRM, Marseille (France)

2016 **Séminaire de Mathématiques Supérieures: Biological Dynamics**, *2 weeks*, University of Alberta, Edmonton (Canada)

2013 **Summer school: Biology for Students in Mathematics**, *1 week*, CIRM, Marseille (France)

## Research and teaching experience

### Current position

Since 2020 **Junior CNRS researcher**, interdisciplinary section 51, affiliated with Institut Camille Jordan UMR 5208, Claude Bernard Lyon 1 University, Villeurbanne (France)

### Past position

2018–2020 **Postdoctal fellow**, *Propagation phenomena and ill-structured reaction–diffusion systems in biology*, mentor: Danielle Hilhorst, Paris-Saclay University, Orsay (France)

### Scientific visits in foreign countries

2019 **Visitor of the Meiji Institute for the Advanced Study of Mathematical Sciences**, *10 days*, invited by Pr. Hiroshi Matano, Tokyo (Japan)

2017 **Visitor of the Department of Mathematics of the Ohio State University**, *3 months*, invited by Pr. Adrian Lam, co-funded by the OSU and the ANR NONLOCAL project, Columbus, Ohio (USA)

### Publications

2026 (with G. Nadin), Planar pulsating traveling wave solutions of non-cooperative Fisher–KPP systems in space-time periodic media, *Dynamics of Partial Differential Equations*, **23 (4)**, pp. 319–346

2026 (with L. Klay, V. Calvez, F. Débarre), Stochastic dynamics at the back of a gene drive propagation wave, *Theoretical Population Biology*, **168**, pp. 44–64

2025 (with T. Giletti, H. Matano), Spreading properties of the Fisher–KPP equation when the intrinsic growth rate is maximal in a moving patch of bounded size, *Annales de l'Institut Fourier*, in press.

2025 (with L. Klay, V. Calvez, F. Débarre), The spatial spread and the persistence of gene drives are affected by demographic feedbacks, density dependence and Allee effects, *Molecular Ecology*, **34 (16)**, e70028

2025 (with I. Mazari), Generalized principal eigenvalues of space-time periodic, weakly coupled, cooperative, parabolic systems, *Mémoires de la Société Mathématique de France*, in press.

2025 Persistence, extinction and spreading properties of non-cooperative Fisher–KPP systems in space-time periodic media, *SIAM Journal on Mathematical Analysis*, **57 (1)**, pp. 233–261

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2023 (with L. Klay, V. Calvez, F. Débarre), Pulled, pushed or failed: the demographic impact of a gene drive can change the nature of its spatial spread, *Journal of Mathematical Biology*, **87 (2)**, 30 pp. 54

2023 (with B. Maucourt), Agro-ecological control of a pest-host system: preventing spreading, *SIAM Journal on Applied Mathematics*, **83 (3)**, pp. 1172–1195

2022 (with D. Hilhorst), Spatial segregation limit of traveling wave solutions for a fully nonlinear strongly coupled competitive system, *Electronic Research Archive*, **30 (5)**, pp. 1748–1773

2022 A note on "Existence and uniqueness of coexistence states for an elliptic system coupled in the linear part", by Hei Li-jun, Nonlinear Anal. Real World Appl. 5, 2004, *Nonlinear Analysis: Real World Applications*, **63**, 103385

2021 (with F. Débarre), Demographic feedbacks can hamper the spatial spread of a gene drive, *Journal of Mathematical Biology*, **83**, 67

2021 (with M. Alfaro, F. Hamel et L. Roques), When the Allee threshold is an evolutionary trait: persistence vs. extinction, *Journal de Mathématiques Pures et Appliquées*, **55**, pp. 155–191

2020 (with Q. Griette), A Liouville-type result for non-cooperative Fisher–KPP systems and nonlocal equations in cylinders, *Acta Applicandae Mathematicae*, **170**, pp. 123–139

2020 (with A. Zilio), Competition in periodic media: III – Existence and stability of segregated periodic coexistence states, *Journal of Dynamics and Differential Equations*, **32**, pp. 257–279

2019 The effect of random dispersal on competitive exclusion – A review, *Mathematical Biosciences*, **318**, 108271

2019 (with V. Calvez and F. Débarre), Catch me if you can: a spatial model for a brake-driven gene drive reversal, *Bulletin of Mathematical Biology*, **81 (12)**, pp. 5054–5088

2019 Two components is too simple: an example of oscillatory Fisher–KPP system with three components, *Proceedings of the Royal Society of Edinburgh - A*, **150 (6)**, pp. 3097–3120

2019 (with A. Lam), Invasion of open space by two competitors: spreading properties of monostable two-species competition-diffusion systems, *Proceedings of the London Mathematical Society*, **119 (05)**, pp. 1279–1335

2018 Addendum to 'Non-cooperative Fisher–KPP systems: traveling waves and long-time behavior', *Nonlinearity*, **32**, pp. 168–171

2018 Non-cooperative Fisher–KPP systems: asymptotic behaviors of traveling waves, *Mathematical Models and Methods in Applied Sciences*, **28 (06)**, pp. 1067–1104

2018 Non-cooperative Fisher–KPP systems: traveling waves and long-time behavior, *Nonlinearity*, **31**, pp. 108–164

2018 (with G. Nadin), Competition in periodic media: II – Segregative limit of pulsating fronts and "Unity is not Strength"-type result, *Journal of Differential Equations*, **265 (01)**, pp. 98–156

2017 Competition in periodic media: I – Existence of pulsating fronts, *Discrete and Continuous Dynamical Systems - Series B*, **22 (04)**, pp. 1341–1360

2015 (with G. Nadin), Traveling waves for diffusive and strongly competitive systems: relative motility and invasion speed, *European Journal of Applied Mathematics*, **26 (04)**, pp. 521–534

## Talks in national or international conferences

2026 **AIMS 2026**, *National and Kapodistrian University of Athens*, Athens (Greece)

2025 **ReaDiNet2025**, *VVF Plaine d'Alsace*, Obernai (France)

2025 **New Trends in Elliptic and Parabolic Equations**, *Banff International Research Station*

2025 **ANR REACH Days**, *School for Advanced Studies in the Social Sciences*, Paris (France)

2024 **ReaDiNet2024**, *VVF Montpeyroux-Auvergne*, Parent Coudes-Champeix (France)

2024 **ANR REACH Days**, *School for Advanced Studies in the Social Sciences*, Paris (France)

2023 **EvoLyon**, *Lumière Lyon 2 University*, Lyon (France)

2022 **Interfacial Phenomena in Reaction-Diffusion Systems**, *Banff International Research Station*, online

2022 **CY Days in Nonlinear Analysis**, *Cergy-Pontoise University*, Cergy-Pontoise (France)

2022 **Mathematical Models in Ecology in evolution**, *Institut Henri Poncaré*, Paris (France)

2021 **Auvergne-Rhône-Alpes PDE Days**, *Jean Monnet University*, Saint-Étienne (France)

2021 **Society of Mathematical Biology, Meeting 2021**, *Online*

2021 **Journée EDP et applications**, *Le Havre University*, Le Havre (France)

2020 **Interfacial Phenomena in Reaction-Diffusion Systems**, *Banff International Research Station*, online

2019 **GDR MAMOVI Days**, *Tours University*, Tours (France)
2019 **Young PDEists Days**, Rennes (France)
2018 **Congress of the GDRI ReaDiNet**, Jeju (South Korea)
2018 **ERC READI Colloquium**, Porquerolles (France)
2018 **ANR NONLOCAL Days**, *Savoie University*, Chambéry (France)
2017 **ANR NONLOCAL Days**, *Paul Sabatier University*, Toulouse (France)
2015 **ANR NONLOCAL Days**, *Complex Systems Institute*, Paris (France)

### Talks in seminars or workshops

2026 **EDPAN Seminar**, *Clermont Auvergne University*, Clermont-Ferrand (France)
2025 **Mathematical physic Seminar**, *Grenoble Alpes University*, Grenoble
2025 **ANCS Seminar**, *Marie & Louis Pasteur University*, Besançon (France)
2024 **Biomaths Workshop**, *Claude Bernard Lyon-1 University*, Villeurbanne (France)
2023 **MAC Seminar**, *Paul Sabatier Toulouse*, Toulouse (France)
2023 **ReaDiNet Workshop**, *University Paris-Saclay*, Orsay (France)
2022 **NCTS Webinar on Nonlinear Evolutionary Dynamics**, *National Taiwan University*, Taiwan
2022 **Mathematical Challenges in Modelling Population Dynamics Workshop**, *Sorbonne University*, Paris (France)
2022 **BEAGLE Team Seminar**, *Inria*, Lyon (France)
2021 **Seminar on modelling in social sciences and life sciences**, *School for Advanced Studies in the Social Sciences*, Paris (France)
2021 **Applied Maths Seminar**, *University of Graz*, Graz (Austria)
2021 **LBBE Seminar**, *Claude Bernard Lyon-1 University*, Villeurbanne (France)
2021 **Chaire MMB**, *Museum d'Histoire Naturelle*, Paris (France)
2020 **MMCS Seminar**, *Claude Bernard Lyon-1 University*, Villeurbanne (France)
2019 **Biomaths Workshop**, *Aix–Marseille University*, Marseille (France)
2019 **Population Dynamics Seminar**, *Bordeaux University*, Bordeaux (France)
2019 **Biomaths Workshop**, *Sorbonne University*, Paris (France)
2019 **EDPs$^2$ Seminar**, *Savoie University*, Chambéry (France)
2019 **Biomaths Seminar**, *Paris Sud University*, Orsay (France)
2019 **Biomaths Seminar**, *Paris 13 University*, Villetaneuse (France)
2019 **ACSIOM Seminar**, *Montpellier University*, Montpellier (France)
2019 **EDPAN Seminar**, *Nice Sophia-Antipolis University*, Nice (France)
2019 **IDP Analysis Seminar**, *Tours University*, Tours (France)
2019 **MEB Seminar**, *Aix–Marseille University*, Marseille (France)
2019 **Workshop on propagation phenomena**, *Meiji University*, Tokyo (Japan)
2018 **MIP Seminar**, *Paul Sabatier University*, Toulouse (France)
2018 **MAS Seminar**, *Paris Descartes University*, Paris (France)
2018 **AA Seminar**, *Aix–Marseille University*, Marseille (France)
2017 **Biomaths Interdisciplinary Seminar**, *Paris Dauphine University*, Paris (France)
2017 **MBI's Visitor Seminar**, *Ohio State University*, Columbus, Ohio (USA)
2017 **PDE Seminar**, *Ohio State University*, Columbus, Ohio (USA)
2016 **CAKE Seminar**, *University of Cambridge*, Cambridge (United Kingdom)
2015 **ERC ReaDi PDE Seminar**, *School for Advanced Studies in the Social Sciences*, Paris (France)

### Posters

2016 **Competition in periodic media: pulsating fronts and segregation**, *Presented at three poster sessions*

### Organisation of scientific meetings

2024 **Propagation and stability in evolution equations**, *Five-days international workshop*, Co-organizer, UBC Okanagan campus, Kelowna, B.C. (USA)

2023 **Ecology, epidemiology and evolution**, *Research school*, Co-organizer, CIRM, Luminy (France)

2022-2024 **Modeling, Analysis and Scientific Calculus Seminar**, *Bimonthly seminar*, Co-organizer, Lyon (France)

2022-2023 **Biomaths Seminar**, *Bimonthly seminar*, Co-organizer, Lyon (France)

2022 **Parabolic and kinetic models in population dynamics workshop**, *Five-days international workshop*, Co-organizer, Toulouse (France)

2019 **PDE–biology Workshop**, *Two-days interdisciplinary workshop focusing on PDE models in biology*, Principal coordinator, Orsay (France)

2016 **SIMBAD Seminar**, *Seminar on biomathematical PDE models primarily aimed at French PhD students and postdoctoral fellows*, Co-principal coordinator, Paris, Lyon, Montpellier (France)

## Most significative fundings

2026-2029 **IMPT project Complex invasion fronts in ecology**, *Co-PI with J. Garnier and E. Vercken*

2023-2028 **ANR project Reach**, *Member*, Principal investigator: Jean-Michel Roquejoffre

2021-2025 **ANR JCJC project Indyana**, *Member*, Principal investigator: Grégory Faye

2019-2023 **ANR JCJC project TheoGeneDrive**, *Collaborator*, Principal investigator: Florence Débarre

2014-2018 **ANR project Nonlocal**, *Collaborator*, Principal investigator: François Hamel

## Reports for peer-reviewed journals

2025 **Journal of Mathematical Biology**

2025 **Mathematische Annalen**

2024 **Journal de Mathématiques Pures et Appliquées**

2024 **Journal of Differential Equations**

2023 **Analysis & PDE**

2023 **Nonlinearity**

2023 **Proceedings of the Royal Society of Edinburgh, Section B**

2022 **Mathematical Modelling of Natural Phenomena**

2022 **Physica D: Nonlinear Phenomena**

2022 **Communications in Partial Differential Equations**

2021 **Nonlinearity**

2021 **Proceedings of the Royal Society of Edinburgh, Section A**

2021 **Journal of Mathematical Biology**

2020 **Nonlinear Differential Equations and Applications**

2020 **Journal of Functional Analysis**

2020 **Annales Henri Lebesgue**

2020 **Discrete and Continuous Dynamical Systems - Series B**

2020 **SIAM Journal on Applied Mathematics**

2020 **Journal of Mathematical Biology**

2020 **Calculus of Variations and Partial Differential Equations**

2019 **Annales de l'Institut Henri Poincaré C, Analyse Non Linéaire/Nonlinear Analysis**

2019 **Journal of Mathematical Biology**

2019 **Discrete and Continuous Dynamical Systems**

2019 **Nonlinear Analysis: Real World Applications**

2018 **Annales de l'Institut Henri Poincaré C, Analyse Non Linéaire/Nonlinear Analysis**

2018 **Nonlinearity**

2018 **Journal of Differential Equations**

2018 **Proceedings of the Royal Society of Edinburgh, Section A**

2017 **SIAM Journal on Mathematical Analysis**

## Awards

2024 **Karl-Peter Hadeler Prize 2023**, *amount 1000€*

2020 **IOP Publishing "Trusted reviewer"**

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2019 **Second award of the Chancellerie de Paris for a PhD thesis in mathematics**, *amount 2000€*

2019 ***Junior Scientific Visibility* funding of the Fondation Mathématique Jacques Hadamard to organize an interdisciplinary workshop**, *amount 2000€*

2019 **"Outstanding Reviewer of 2018" award by Nonlinearity**

2018 **Postdoctoral fellowship *Mathematics Life Sciences* of the Fondation Mathématique Jacques Hadamard**

2016 **Honorable Mention of the poster session of the Séminaire de Mathématiques Supérieures**

### Teaching

2015–2018 **Tutorials**, *Multivariable calculus*, 2nd year of Licence and 2nd year of *Classe préparatoire intégrée*, Sorbonne University, Paris (France)

2022–2025 **Lectures**, *Mathematical modelling in spatial ecology*, M2, University Claude Bernard Lyon 1, Lyon (France)

### Mentoring

2021–2024 **Baptiste Maucourt**, *Mathematical modelling and analysis of a system with three trophic levels, a vector-borne disease and space-time periodicity*, M2 research internship and PhD

2020–2023 **Léna Klay**, *Gene drive mathematical models for population control*, PhD

## Languages

French First language

English Fluent

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