Curriculum Vitae
Marina AMADO FERREIRA
Analysis ∗ Mathematical Physics ∗ Mathematical Biology

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RESEARCH INTERESTS

- Smoluchowski coagulation-type equations

- Kinetic equations and PDEs

- Many-particle systems

- Nonequilibrium statistical mechanics

- Applications in physics and biology

EMPLOYMENT

FEB 2024 - present	CNRS Researcher, **University of Toulouse**, France
APR 2023 - JAN 2024	Junior Researcher, **University of Coimbra**, Portugal
AUG 2018 - MAR 2023	Postdoctoral Researcher, **University of Helsinki**, Finland

CAREER BREAKS

JUL - DEC 2020	Parental leave
JUN - OCT 2023	Parental leave
OCT 2023 - JAN 2024	Partial parental leave

EDUCATION

AUG 2018	PhD Degree in Mathematics, **Imperial College London**, UK
	Congestion in many-particle systems with volume exclusion constraints:
	algorithms and applications to modelling in biology
	Supervisors: Pierre DEGOND and Sara MERINO-ACEITUNO
SEP 2014	Master Degree in Mathematics, Branch in Statistics, Optimization and
	Financial Mathematics, **University of Coimbra**, Portugal
	Stochastic differential equation models in population dynamics,
	Supervisor: Cristina ROSA
JUL 2014	Master Degree in Mathematics, Branch in Applied Analysis
	and Computational Mathematics, **University of Coimbra**, Portugal
	Spacial pattern formation in biological systems,
	Supervisor: Paula OLIVEIRA
2011 - 2012	ERASMUS programme, **Darmstadt University of Technology**, Germany
	Seminar in Mathematical Methods of Physics: *Hysteresis operators*
	Supervisor: Hans-Dieter ALBER
JUL 2011	Bachelor's Degree in Mathematics at **University of Coimbra**, Portugal

PUBLICATIONS AND PREPRINTS

[1] S. Plunder, C. Danesin, B. Glise, M. A. Ferreira, S. Merino-Aceituno, E. Theveneau, Modelling variability and heterogeneity of EMT scenarios highlights nuclear positioning and protrusions as main drivers of extrusion, bioRxiv, **submitted**, 2023

[2] P. Degond, G. Dimarco, M. A. Ferreira, S. Hecht, *Modeling ballistic aggregation by time stepping approaches*, arXiv:2309.09523, **submitted**, 2023

[3] M. A. Ferreira, J. Lukkarinen, A. Nota, J.J.L. Velázquez, *Asymptotic localization in multicomponent mass conserving coagulation equations*, arXiv:2203.08076, **submitted**, 2022, 33 p.

[4] M. A. Ferreira, J. Lukkarinen, A. Nota, J.J.L. Velázquez, *Non-power law constant flux solutions for the Smoluchowski coagulation equation*, 2022, arXiv:2203.08076, **accepted at SIAM Journal on Mathematical Analysis**, 2024, 35 p.

[5] M. A. Ferreira, E. Franco, J. Lukkarinen, A. Nota, J. J. L. Velázquez, *Coagulation equations with source leading to anomalous self-similarity*, **Journal of Physics A: Mathematical and Theoretical**, 2023, 33 p.

[6] I. Cristian, M. A. Ferreira, E. Franco, J.J.L. Velázquez, *Long-time asymptotics for coagulation equations with injection that do not have stationary solutions*, arXiv: 2211.16399, **Archive for Rational Mechanics and Analysis**, 2023, 43 p.

[7] M. A. Ferreira, J. Lukkarinen, A. Nota, J. J. L. Velázquez, *Non-equilibrium stationary solutions for multicomponent coagulation systems with injection*, **Journal of Statistical Physics**, 2023, 36 p.

[8] M. A. Ferreira, E. Franco, J .J. L. Velázquez, *On the self-similar behaviour of coagulation systems with injection*, **Annales de l'Institut Henri Poincaré C, Analyse non linéaire**, 2022, 49 p., accepted

[9] M. A. Ferreira, J. Lukkarinen, A. Nota, J. J. L. Velázquez, *Localization in stationary non-equilibrium solutions for multicomponent coagulation systems*, **Communications in Mathematical Physics**, 2021, 27 p., doi: 10.1007/s00220-021-04201-z

[10] M. A. Ferreira, J. Lukkarinen, A. Nota, J. Velázquez, *Stationary non-equilibrium solutions for coagulation systems*, **Archive for Rational Mechanics and Analysis**, 2021, 67 p., doi: 10.1007/s00205-021-01623-w

[11] M. A. Ferreira, *Coagulation equations for aerosol dynamics*, In "Trails in Kinetic Theory: foundational aspects and numerical methods", **SEMA SIMAI Springer Series** 2021, 29 p., doi: 10.1007/978-3-030-67104-4

[12] C. Danesin, M. A. Ferreira, P. Degond, E. Theveneau, *Anteroposterior elongation of the chicken anterior trunk neural tube is hindered by interaction with its surrounding tissues*, **Cells & Development**, 2021, doi: 10.1016/j.cdev.2021.203723

[13] P. Degond, M. A. Ferreira, S. Merino-Aceituno, M. Nahon, *A new continuum theory for incompressible swelling material*, **SIAM Journal on Multiscale Modeling and Simulation**, 2020, 35 p., doi: 10.1137/18M1203158

[14] M. A. Ferreira, E. Despin-Guitard, F. Duarte, P. Degond, E. Theveneau *Interkinetic nuclear movements promote apical expansion in pseudostratified epithelia at the expense of apicobasal elongation*, **Plos Computational Biology**, 2019, doi:10.1371/journal.pcbi.1007171

[15] P. Degond, M. A. Ferreira, S. Motsch, *Damped Arrow-Hurwicz algorithm for sphere packing*, **Journal of Computational Physics**, 2017, 19 p., doi:10.1016/j.jcp.2016.11.047

[16] K. Korvasová, E. A. Gaffney, P. K. Maini, M. A. Ferreira, V. Klika, *Investigating the Turing conditions for diffusion-driven instability in the presence of a binding immobile substrate*, **Journal of Theoretical Biology**, 2015, doi:10.1016/j.jtbi.2014.11.024

Awards and funding

2016	IMA Small Grant Scheme (£400)
	awarded by Institute of Mathematics and its Applications (IMA) to attend a CIMPA Summer Research School in "Mathematical modeling in Biology and Medicine" in Santiago de Cuba in June 2016
2014	Roth scholarship (£15,726/year, 3.5 years)
	awarded by the Dep. of Mathematics of Imperial College London for proceeding PhD studies
2011	Erasmus scholarship (1800€)
	mobility grant to study a year abroad at Darmstadt University of Technology in 2011/2012
2009	Novos talentos em Matemática (200€ x 12 months)
	research scholarship funded by Calouste Gulbenkian Foundation, Topic: *T*ableaux, Supervisor: Olga Azenhas
2008	Bolsa de integração à Investigação (150€ x 12 months)
	research scholarship funded by Foundation for Science and Technology, Topic: *M*atrices, graphs and eigenvalues, Supervisor: Leal Duarte

Participation in scientific projects

2022-2029	Finnish centre of excellence in Randomness and STructures (FiRST), Finland
	This project consists of 11 research groups from 4 universities in Finland (Helsinki, Jyväskylä, Turku and Aalto). Funding secured $\sim 10M$€ by the Academy of Finland. *Goal:* the mathematical development at the crossroads between probabilistic methods, quantum and conformal field theory, geometric and harmonic analysis, partial differential equations and analytic number theory.
2017-2020	Atmospheric Mathematics Collaboration, Helsinki, Finland.
	This project joins 4 research groups from the Department of Mathematics and Statistics and the Department of Physics. *Goal:* to strengthen our core expertize in the fields of mathematics used in atmospheric sciences and apply their methods to concrete problems.

Invited talks

26-30 Aug 2024	"Exploring Interacting Particle Systems - Bridging Macroscopic and Microscopic Worlds" at the Latin American and Caribbean Mathematics Congress 2024, João Pessoa, Brazil
27 Feb 2024	Séminaire de Probabilités at Institut de Mathématiques de Toulouse, France
6 Nov 2023	Particle Systems and Partial Differential Equations XI, Lisbon
27 Oct 2023	Analysis seminar, Center for Mathematics of the University of Coimbra, Portugal
18 Apr 2023	MAC Seminar (Modelling, Analysis and Computation) at Institut de Mathématiques de Toulouse, France, 18 Apr 2023
2 Mar 2023	Séminaire Orléans, Orleans, France, 2 Mar 2023
3 Mar 2023	Seminar, Reims, France, 3 Mar 2023
14-18 Nov 2022	Research School 'Kinetic Theory', CIRM, France (onsite)
7-9 Sep 2022	*Plenary speaker* at 2nd Meeting for women mathematicians in Portugal, University of Minho, Portugal (onsite)
18-21 Aug 2022	28th Nordic Congress of Mathematicians, Aalto University, Finland (onsite)
16 Mar 2022	General Colloquium lectures, Leiden, Netherlands, *Analysis of multiscale phenomena* (onsite)
4-5 Jan 2022	Finnish Mathematical Days , Tampere, Finland, *Coagulation equations for open systems* (online)
17-28 May 2021	SIAM Conference on Mathematical Aspects of Materials Science (MS20), Bilbao, Spain, *Asymptotic localization in multicomponent coagulation equations* (online)
13 May 2020	Mathematical Physics Seminar, Helsinki, Finland *Mass localization in mass-preserving solutions to multicomponent coagulation equations* (online)
20-24 Jan 2020	Mathematics for atmospheric-biospheric science, Atmospheric Mathematics Workshop, Himos, Finland *Stationary solutions to coagulation equations with source*

11-14 Dec 2019	SIAM Conference on Analysis of Partial Differential Equations (PD19), La Quinta, California, USA *Stationary solutions to Smoluchowski's coagulation equation with a source term*
11-14 Dec 2019	SIAM Conference on Analysis of Partial Differential Equations (PD19), La Quinta, California, USA *Multicomponent Coagulation Equation for Aerosol Dynamics*
6 Dec 2019	Seminar in Partial Differential Equations, Arizona State University, USA *Mass localization in multicomponent coagulation systems*
3 Dec 2019	CNA Seminar, Carnegie Mellon University, USA *Mass localization in multicomponent coagulation systems*
18 Jul 2019	Seminar Series Coagulation-fragmentation, Bonn, Germany *Coagulation equations with source for aerosol dynamics*
17-21 Jun 2019	Workshop: Analytical and Computational Problems for Mixtures and Plasma Dynamics, Bonn, Germany *Multicomponent coagulation equation for aerosol dynamics*
20-24 May 2019	Summer School "Trails in kinetic theory: foundational aspects and numerical methods", Bonn, Germany *Coagulation equations for aerosol dynamics*
17 Apr 2019	Biomathematics Seminar, Helsinki, Finland *Particle-based models with volume-exclusion constraints and applications to biology*
7 Dec 2018	Oberseminar Analysis, Bonn, Germany *Coagulation equations for aerosol dynamics*
26-28 Sep 2018	Workshop Mathematics for atmospheric-biospheric science, Hyytiälä, Finland *Multi-species coagulation system with constant sources*
22 Aug 2018	Mathematical Physics Seminar, Helsinki, Finland *Particle-based models with volume-exclusion constraints and applications to biology*
12 Jul 2018	Oberseminar Analysis Summer 2018, Bonn, Germany *Particle-based models with volume-exclusion constraints and applications to biology*
1 Jun 2018	Atmospheric Mathematics seminars, Helsinki, Finland *Flux solutions for coagulation-fragmentation systems*
9 Jan 2018	Biomaths seminar, Inria, Lyon, France *The dynamics of a packed cell tissue*
5 Oct 2017	Mathématiques pour la biologie seminar, Toulouse, France *The dynamics of a packed cell tissue*
18-22 Sep 2017	Form and deformation in solid and fluid mechanics, Cambridge, UK *The dynamics of a packed cell tissue*
24 May 2017	Seminar, Ferrara, Italy *Time-stepping schemes for hard-particle systems*
4-6 Dec 2016	Mathematics of Complex Systems: from precision medicine to smart cities, Coimbra, Portugal *A framework for modelling packed cell tissues*
11 May 2016	CAKE seminars, Cambridge, UK *Damped Arrow-Hurwicz algorithm for sphere packing*
9 Mar 2016	PDE Day, Imperial College London, UK *Damped Arrow-Hurwicz algorithm for sphere packing*

Research supervision

2022-2023	Master student Sakari Pirnes (co-supervisor: Jani Lukkarinen) *Existence of solutions to coagulation equations arising from applications.*
2020-present	PhD candidate Aleksis Vuoksenmaa (main supervisor: Jani Lukkarinen.) Topic: Analysis of kinetic equations. Expected graduation date: 2024.
2018-2022	PhD candidate Eugenia Franco (co-supervised with Mats Gyllenberg and Odo Dieckmann). Opponent: Marie Doumic. Pre-examiners: Benoit Perthame and Silvia Cuadrado.) *Integral and integro-differential equations with measure-valued solutions describing the evolution of structured populations.*

Teaching experience

Lectures

Spring 2023	*Coagulation Dynamics* (5 credits, Master's Programme in Mathematics and Statistics), University of Helsinki.
Autumn 2021	*Introduction to vector analysis* (5 credits, Bachelor's programme in Science, Module: Mathematics), University of Helsinki. Tasks: preparation of lectures, preparation of weekly exercises, project works and development of online support material in Moodle.
Spring 2020	*Coagulation Dynamics* (5 credits, created a *new* Master course), University of Helsinki. Tasks: design and delivery of lectures, preparation of weekly exercises, project works and development of lecture notes.

Reading group

Autumn 2018	Organizer of a reading group in Kinetic Theory, University of Helsinki. Book: R. Soto, Kinetic Theory and Transport Phenomena (Oxford University Press 2016). Number of regular attendees: 4 postdocs and PhD candidates.

Teaching assistant

2016-2017	Real Analysis; Probability and Statistics II at Imperial College London.
2015-2016	Differential Equations at Imperial College London.
2014-2015	Foundation of analysis; Real Analysis; Introduction to Numerical Analysis; Mechanics at Imperial College London.
2012-2013	Monitor in a mathematical school for young people Delfos Junior at University of Coimbra.

CONTRIBUTED TALKS AND POSTERS

28 JUN – 5 JUL 2022	Probability and Mathematical Physics, Helsinki, Finland, Satellite conference of ICM, *Asymptotic localization in multicomponent mass conserving coagulation equations* (**contributed poster**) (onsite)
2-7 AUG 2021	International Congress on Mathematical Physics, Geneva, Switzerland, *Stationary non-equilibrium solutions for coagulation equations* (**contributed talk**) (onsite)
19-23 NOV 2018	Particle Systems and PDE's VII, Palermo, Italy *Coagulation systems for aerosol dynamics* (**contributed poster**)
24-26 SEP 2018	Young women in Mathematical Physics, Bonn, Germany *A time-stepping algorithm for ballistic aggregation* (**contributed poster**)
30 APR - 4 MAY 2018	Collective dynamics and Self-organization in biological sciences, International Center for Mathematical Sciences, Edinburgh, UK *Dynamics and shape of a packed cell tissue* (**contributed poster**)
24-26 SEP 2018	Young women in Mathematical Physics, Bonn, Germany *A time-stepping algorithm for ballistic aggregation* (**contributed poster**)
30 APR - 4 MAY 2018	Collective dynamics and Self-organization in biological sciences, International Center for Mathematical Sciences, Edinburgh, UK *Dynamics and shape of a packed cell tissue*(**contributed poster**)
27 APR 2017	Maths PhD Poster Competition, London, UK *Mechanical model for cancer formation from a pseudo-stratified epithelial tissue* (**contributed poster**)
27-31 MAR 2017	Hybrid multiscale modelling and validation, Columbus, Ohio, USA *Mechanical model for cancer formation from a pseudo-stratified epithelial tissue* (**contributed poster**)
11-15 JUL 2016	European Conference in Mathematical and Theoretical Biology, Nottingham, UK *A general framework for modelling the epithelial tissue* (**contributed talk**)
9-13 MAY 2016	Mathematical topics in Kinetic theory, Cambridge, UK *Damped Arrow-Hurwicz algorithm for sphere packing* (**contributed poster**)

27-29 Jul 2013	AARMS Mathematical Biology Workshop, Memorial University of Newfoundland, Canada
	Binding in pattern formation **(contributed talk)**

Outreach activities

Science outreach

- Popular science in Portugal: published article *Estrutura de espelhos em paineis fotovoltaicos* in **Gazeta de Matemática**, 2017

- Seminars for high school students in Coimbra, Portugal, *Travar a invasão de um tumor: modelo matemático de um tecido celular* (2017),

- Seminars for high school students in Coimbra, Portugal, *Melodias matemáticas* (2015),

- *Música e matemática* published in the student newspaper 441 Hertz, 2011.

Publications intended for professional communities

- D. Badziahin, F. B. Planella, M. A. Ferreira, S. Gazzola, J. G. Herterich, S. Lim, R. Pronko, J. Skinner, Segmentation and scene content in moving images: shadow detection and removal, **European Study Group with Industry**, Manchester, UK, 2015.

- A. Fidalgo, A. Gomes, A. Goucha, D. Jordao, M. A. Ferreira, S. Lang, Mirror augmented photovoltaic panels: optimal configurations to increase the global solar exposition over an entire day, **I Iberian Modelling Week, Universidade de Coimbra**, Portugal, 2014.

- S. Eberhard, M. Ferreira, N. S. Johnsen, L. S. Mendoza, Modelling of a Storage Water Heater, **European Summer School in Industrial Mathematics and Modelling Week**, Instructor: Joachim Krenciszek, Dresden, Germany, 2012.

Management activities

- Organizer of the *3rd Women in Mathematics Meeting*, Coimbra, July, 24–26, 2023 (approx. 70 participants).

- Board member of the Kumpula Junior Faculty Club 2021-2023 aimed at early career researchers from the Departments of Chemistry, Computer Science, Geosciences and Geography, Mathematics and Statistics, and Physics.

- Editor since 2019 and founder of the Maths Section of Emergent Scientist: an open access peer-reviewed journal aiming at publishing pedagogical reviews or innovative approaches to problems in mathematics or physics.

- Reviewer for the journals *Kinetic and Related Models*, *Journal of Nonlinear Science*, *Electronic Communications in Probability*, *SIAM Journal on Mathematical Analysis*, *Physica D: Nonlinear Phenomena*.

- Membership at Society for Industrial and Applied Mathematics (SIAM), at European Society for Mathematical and Theoretical Biology (ESMTB) at Sociedade Portuguesa de Matemática (SPM) and European Women in Mathematics (EWM).

- Participation in a successful funding application in Sep 2021 *Finnish centre of excellence in Randomness and STructures (FiRST)* as a representative of early-career researchers. Funding secured is 8.8M over 4 years within the Centre of Excellence Programme 2022-2029 funded by the Academy of Finland.

- Organizer of the session *Deterministic and stochastic coagulation-fragmentation models* at the Portuguese Mathematical Society Annual Conference (ENSPM21), 12-16 July 2021 (online). Number of attendees: ~ 10.

- Member of the hiring committee for a PhD student at the Vienna Doctoral School of Mathematics in 2019.

- AMMP Post Graduate Research Representative at Imperial College London 2015/16 and 2016/17 (represent PhD students at departmental and inter-departmental meetings, co-organizer of weekly social activities).

- Committee member of the Imperial SIAM Student Chapter 2015/2016.

- Co-organizer of weekly seminars *Junior Applied Mathematics Seminar* (5-15 participants, 2015/16), *PDE Day* (30 participants, 9 March 2016) and the *Imperial SIAM Student Chapter Annual conference* (3 June 2016, 50 participants) held at Imperial College London, United Kingdom..

- Founder and organizer of the *I Iberian Modelling Week* held at University of Coimbra, Portugal (7-12 September 2014, 30 participants from Europe). This event has been organized every year since its first edition alternating between Portugal and Spain.

- Organizer of the cycle of mathematical seminars *Matemática à Quarta* at the Department of Mathematics of the University of Coimbra in 2013/2014. Professors of the department are invited to present research talks to the undergrad and master students in the department. (Attendance $\sim$ 10-20).

- Treasurer at the student association Núcleo de Estudantes de Matemática da Universidade de Coimbra in 2013/2014.

- Secretariat at the cultural association Tuna Académica da Universidade de Coimbra in 2013/2014.

LANGUAGES

PORTUGUESE:	Mother tongue		GERMAN:	Independent user
ENGLISH:	Fluent		FINNISH:	Basic Knowledge
FRENCH:	Basic Knowledge			

COMPUTER SKILLS

Matlab, Fortran90, C, R.

OTHER INTERESTS AND ACTIVITIES

Violinist at Ylioppilaskunnan Soittajat (Helsinki University Symphony Orchestra, 2018-2023), Imperial College Sinfonietta (London, 2014-2018), Tuna Académica da Universidade de Coimbra (2012-2014), TU-Orchester (Darmstadt, 2011/2012) and Camerata Joanina (Coimbra, 2010-2011).

Friday 8th March, 2024