

Helena Ribera Ponsa

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Nationality Spanish.

Research Interests

Partial differential equations; Numerical techniques; Computational Modelling; Asymptotic analysis; Moving-boundary problems; Applied mathematics.

Employment History

2018-Present Postdoctoral Researcher - Centre d'Elaboration de Materiaux et d'Etudes Structurales
Project title: Imagerie optique sans lentille des nanoparticules sur une surface et dans une matrice polymère (Lensless optical imaging of nanoparticles on a surface and in a polymer matrix).

May 2014 - University of Bristol

Aug. 2014 *PGR Engagement Intern*

I worked with the UBU Postgraduate Network to audit and analyse engagement and representation of postgraduate researchers across the University, including communications channels, the processes for recruiting PGR reps, and access to training opportunities.

Oct. 2012 - Centre de Recerca Matemàtica

Jun. 2013 *Research Assistant*

I worked within the Industrial Mathematics Group in two problems: nanofluids and phase change at the nanoscale. I learned about perturbation theory and some numerical techniques, both in the PDEs context.

Education

2014-2018 PhD - Centre de Recerca Matemàtica & Universitat Politècnica de Catalunya

Supervised by Professor Tim Myers.

The goal of my thesis was to develop and analyse mathematical models of the growth or shrinkage of nanoparticles. The initial work built on mathematical models of melting at the nanoscale, and involved solving heat equations coupled to a phase change model, using approximate analytical and numerical methods. The other phenomena which I modelled was the Kirkendall effect with the aim to understand how to create hollow structures at the nanoscale.

2013-2014 MRes Complexity Sciences - University of Bristol

Distinction.

Project #1. Bio-inspired adaptive sonar navigation.

Supervised by Dr. Marc Holderied, Dr. Luca Giuggioli and Dr. Dieter Vanderelst.

Project #2. Ant-based nanoparticle strategies for the imaging of rare tumour events.

Supervised by Dr. Sabine Hauert and Professor Nigel Franks.

2008-2012 B. Sc. Mathematics - Universitat de Barcelona

Operators on Spaces of Analytic Functions.
Supervised by Professor Jordi Pau Plana.

Research visits

Sep. 2016 - Visiting International Research Student - The University of British Columbia

Nov. 2016 *Supervised by Professor Brian Wetton.*

Three-month visiting researcher at the Institute of Applied Mathematics (IAM) as part of my PhD working on the nano-Kirkendall effect.

Journal and Proceedings papers

- [1] **H. Ribera**, and T. G. Myers (2018). A Model for Nanoparticle Melting with a Newton Cooling Condition and Size-Dependent Latent Heat. *Progress in Industrial Mathematics at ECMI 2016*, 301-308.
- [2] V. Cregan, T. G. Myers, S. L. Mitchell, **H. Ribera**, M. C. Schwarzwälder (2018). Nanoparticle Growth via the Precipitation Method. *Progress in Industrial Mathematics at ECMI 2016*, 357-364.
- [3] T. G. Myers, **H. Ribera**, and W. Bacsá. Detecting nanoparticles and the phase shift with visible wavelength light. To be submitted to *Physical Review Letters*.
- [4] **H. Ribera**, B. Wetton, and T. G. Myers. Mathematical model for substitutional binary diffusion in solids. Submitted to *Applied Mathematical Modelling*, December 2017. Manuscript reference number: APM-D-17-03147.
- [5] **H. Ribera**, B. Wetton, and T. G. Myers. Cellular Automata models applied in substitutional binary diffusion in solids. Submitted to *Journal of Cellular Automata*, December 2017.
- [6] **H. Ribera**, T. G. Myers, and M. M. MacDevette. Improving the heat balance integral method solutions in spherical and cylindrical Stefan problems. Submitted to *Applied Mathematics and Computation*, November 2017. Manuscript reference number: AMC-D-18-00845.
- [7] T. G. Myers, **H. Ribera**, and V. Cregan (2017). Does mathematics contribute to the nanofluid debate? *International Journal of Heat and Mass Transfer*, 111, 279-288.
- [8] **H. Ribera**, and T. G. Myers (2016). A mathematical model for nanoparticle melting with size-dependent latent heat and melt temperature. *Microfluidics and Nanofluidics*, 20, 147.
- [9] R. Bacsá, W. Bacsá, M. Calvo Schwarzwälder, V. Cregan (report coordinator), M. Fernandez-Pendas, S. Fernandez-Mendez, B. Florio, N. Gómez Bastus, A. Marquina, I. Moyles, T. G. Myers, **H. Ribera**, S. Rusconi, S. Serna, C. Vázquez-Cendón, and J. Piella (2016). Synthesis of monodisperse spherical nanocrystals. *Proceedings of the 115th ESGI*, Centre de Recerca Matemàtica (Spain). ISBN: 978-84-697-5163-3.
- [10] T. G. Myers, M. M. MacDevette, and **H. Ribera** (2013). A time-dependent model to determine the thermal conductivity of a nanofluid. *Journal of Nanoparticle Research*, 15(7), 1-11.

Research Funding

- [1] MI-NET (COST Action TD1409) - Short-Term Scientific Missions (STSM). Funding to do a month-long research visit to the Centre d'Elaboration de Materiaux et d'Etudes Structurales (CEMES) in Toulouse, France.
- [2] MI-NET (COST Action TD1409) - Funding to participate in the Modelling Camp 2017 held at the International Centre for Mathematical Sciences in Scotland, United Kingdom.

Conferences and invited talks

- [1] T. G. Myers, **H. Ribera**, F. Neumayer, S. Weber and **W. S. Bacsá**. Imaging nanoparticles without an optical lens. Poster session presented at the conference OPTIQUE Toulouse 2018. Université Toulouse III - Paul Sabatier (France) July 2018.
- [2] Applicable Analysis Seminar. Department of Mathematics, Simon Fraser University (Canada). November 2016.
- [3] **H. Ribera** and T. G. Myers. *Mathematical modelling of nanoparticle evolution: Phase change and the Kirkendall effect*. Nanomath 2016. CEMES-CNRS (France). June 2016.
- [4] V. Cregan, T.G. Myers, H. Ribera and M. Calvo Schwarzwälder. Models of Diffusion Phenomena from Nanoscience. Nanomath 2016. CEMES-CNRS (France). June 2016.
- [5] **H. Ribera** and T. G. Myers. *A model for nanoparticle melting with a Newton cooling condition and size-dependent latent heat*. ECMI 2016. University of Santiago de Compostela (Spain). June 2016.
- [6] V. Cregan, T.G. Myers, H. Ribera and M. Calvo Schwarzwälder. Nanoparticle growth via the precipitation method. ECMI 2016. University of Santiago de Compostela (Spain). June 2016.

Workshop participation

- [1] Modelling Camp 2017. International Centre for Mathematical Sciences (Scotland, United Kingdom). May 2017.
- [2] Graduate Mathematical Modelling in Industry Workshop. The University of British Columbia (Canada). August 2016.
- [3] 115th ESGI. Centre de Recerca Matemàtica (Spain). January 2016.
- [4] 110th ESGI. University of Limerick (Ireland). June-July 2015.
- [5] Student Mathematical Modelling Workshop. University of Limerick (Ireland). June 2015.

Teaching Experience

- 2017** Lecturer and mentor
Facultat de Matemàtiques, Universitat Politècnica de Catalunya, Barcelona, Spain.
Course: Mathematical models of technology.
Level: Final year undergraduate.
- 2017** Final high school project co-supervisor
Co-supervisor of the mandatory research project on the last year of high school entitled “Mathematics at the nanoscale” by Ariadna Moreno Sells.
- 2016** Master thesis co-supervisor
Co-supervisor of the master’s thesis entitled “Boundary conditions for the nanoscale Stefan problem” by Adrià González Esteve, in the M. Sc. in Advanced Mathematics and Mathematical Engineering programme in the Universitat Politècnica de Catalunya, Barcelona, Spain.

Mathematics and Science Outreach

- 2016, 2017** *Bojos per les Matemàtiques* (Crazy for Mathematics) Mathematics and Science Outreach seminars, organised by the Federació d’Entitats per a l’Ensenyament de les Matemàtiques a Catalunya (FEEMCAT) i la Societat Catalana de Matemàtiques (SCM).

Languages

Catalan. Mother tongue.

Spanish. Mother tongue.

English. Full working proficiency (C1).

Referees

Name Timothy G. Myers
Position Senior Researcher.
Centre de Recerca Matemàtica.
08193 Bellaterra, Spain.
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Name Brian Wetton
Position Professor.
The University of British Columbia.
Vancouver, BC, Canada.
Contact wetton@math.ubc.ca