



Dr Lucia Marucci
BSc, MSc, PhD

Associate Professor in Systems and Synthetic Biology

Area of research

Quantitative understanding and control of cell complexity and decision-making

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Summary

Cell decision-making is orchestrated by the complex interplay between intracellular dynamics and the extracellular environment. How do these components produce emergent phenotypes and affect cell decision-making? Can cell fate be directly engineered? Can mathematical models aid in the understanding the basis of living organism regulations and guide their re-engineering?

My multidisciplinary Systems and Synthetic Biology research group aims at answering these questions combining wet-lab experiments and computational research. The main aims are to:

- i) get a quantitative understanding of the link between signalling pathway dynamics, cell-cycle and stem cell pluripotency. We combine tools from Systems and Synthetic Biology at population- and single-cell levels, and are currently setting-up a microscopy/microfluidics platform for real-time mammalian cells imaging and control;
- ii) develop agent-based modelling tools for describing and predicting single-cell dynamics accounting for gene regulatory networks, cell morphology, cell growth and geometry of the environment;
- iii) use *in silico* algorithms for rational minimal genome design, taking advantage of Whole-Cell models

Biography

I am a computational biology scientist, with interdisciplinary experience in Synthetic Biology (control and modelling of synthetic gene regulatory networks) and Systems Biology (modelling and studying the functional role of signalling and cell-cycle dynamics in mammalian cells).

I received a Bachelor degree in Mathematics in the University of L'Aquila (Italy) in 2003, followed in 2007 by a Master degree in Mathematics and Informatics in the same University. In 2010 I received a Ph.D. degree in Automatic Engineering in the University of Naples "Federico II", Italy. My Ph.D. was focused on the mathematical modelling and analysis of synthetic gene regulatory networks. From 2011 to 2013 I was a PostDoc EMBO fellow in the Centre for Genomic Regulation (CRG), Barcelona, Spain, studying the links between signalling pathways dynamics and somatic cell reprogramming. In September 2013 I joined Bristol University as Lecturer in Engineering Mathematics. I am currently an EPSRC Early Career Fellow, and Associate Professor in Systems and Synthetic Biology.

Teaching

I contribute to both undergraduate and postgraduate programmes.

I am unit-director of the Mathematical Modelling in Physiology and Medicine unit (M level), and teach part of Engineering Mathematics 1 and MDM2 units.

I contribute to teaching activities of the BBSRC/EPSRC Centre for Doctoral Training in Synthetic Biology (Bristol, Oxford and Warwick Universities).

Keywords

- Systems Biology
- Synthetic Biology
- Pluripotency
- Non-linear dynamics
- Microfluidics

Memberships

Organisations

[Department of Engineering Mathematics](#)

Other sites

- [Engineering](#)
- [Engineering-mathematics](#)

Recent publications

- Olivas, SLM, Marucci, L & Homer, ME, 2019, '[Mathematical models of organoid cultures](#)'. *Frontiers in Genetics*, vol 10.
- Landon, S, Rees, J, Marucci, L & Grierson, C, 2019, '[Genome-driven cell engineering review: In vivo and in silico metabolic and genome engineering](#)'. *Essays in Biochemistry*, vol 63., pp. 267-284
- Pedone, E & Marucci, L, 2019, '[Role of \$\beta\$ -Catenin Activation Levels and Fluctuations in Controlling Cell Fate](#)'. *Genes*, vol 10.
- Postiglione, L, Napolitano, S, Pedone, E, Rocca, D, Aulicino, F, Santorelli, M, Tumaini, B, Marucci, L & Bernardo, Dd, 2018, '[Regulation of Gene Expression and Signaling Pathway Activity in Mammalian Cells by Automated Microfluidics Feedback Control](#)'. *ACS Synthetic Biology*, vol 7., pp. 2558-2565
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- Fiore, G, Matyjaszkiewicz, A, Annunziata, F, Grierson, C, Savery, NJ, Marucci, L & Di Bernardo, M, 2017, '[Design of a multicellular feedback control strategy in a synthetic bacterial consortium](#)'. in: *2016 IEEE 55th Conference on Decision and Control (CDC 2016): Proceedings of a meeting held 12-14 December 2016, Las Vegas, Nevada, USA*. Institute of Electrical and Electronics Engineers (IEEE), pp. 3338-3343
- Fiore, G, Matyjaszkiewicz, A, Annunziata, F, Grierson, C, Savery, N, Marucci, L & Di Bernardo, M, 2017, '[In-Silico Analysis and Implementation of a Multicellular Feedback Control Strategy in a Synthetic Bacterial Consortium](#)'. *ACS Synthetic Biology*, vol 6., pp. 507-517
- Matyjaszkiewicz, AW, Fiore, G, Annunziata, F, Grierson, CS, Savery, NJ, Marucci, L & Bernardo, Md, 2017, '[BSim 2.0: An Advanced Agent-Based Cell Simulator](#)'. *ACS Synthetic Biology*, vol 6., pp. 1969-1972

[View complete publications list](#) in the University of Bristol publications system

Courses

Dr Marucci currently teaches 4 courses: