Last updated October 9th 2025

ROSA MARTINEZ CORRAL
CURRICULUM VITAE

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Brief summary of academic and scientific background
I am a computational biologist that integrates experimental data analysis with theory and mathematical modelling to interrogate fundamental aspects cellular regulation. Through my career I have addressed problems at different levels of complexity, from molecular circuits to multicellular systems, in collaboration with multiple experimental groups. I have a background in Biology and Bioinformatics from Universitat Pompeu Fabra, and postdoctoral training from Harvard Medical School.
Research topics: regulation of gene expression, mechanistic modelling, hybrid mechanistic/deep-learning models, high-throughput data analysis.

ACADEMIC POSITIONS

10/2025- **Tenure-track group leader at Universitat Pompeu Fabra (UPF), Department of Medicine and Life Sciences, Barcelona, Spain**
Head of the Theoretical Regulatory Biology Group

2023-2025 **Independent Fellow, Barcelona Collaboratorium for Modelling and Predictive Biology, Centre for Genomic Regulation (CRG)**
Head of the Theoretical Regulatory Biology Group

2023-2025 **External professor (*profesora asociada*), UPF**
Coordinator and professor of the course *Evolutionary Algorithms* of the BSc in Biomedical Engineering.

2019-2022 **Research fellow (postdoc), Department of Systems Biology, Harvard Medical School.**
Research Advisors: Prof. J. Gunawardena and Prof. A.DePace.
Research topic: Biophysical basis for combinatorial control in eukaryotic gene regulation.

EDUCATION

2014-2018 **PhD in Biomedicine, UPF.**
Advisor: Prof. Jordi Garcia Ojalvo
PhD thesis: *Modelling spatiotemporal cell regulation.*
Excellent *Cum Laude* and PhD extraordinary award.

Research stays:
March 2017-June 2017. Gunawardena Group, **Harvard Medical School.**
November 2015. Suel Lab, **University of California San Diego.**
February 2015 – March 2015. Elowitz Lab, **California Institute of Technology.**

2013-2015 **MSc in Bioinformatics for Health Sciences, UPF.**
Master thesis (Advised by Prof. Jordi Garcia Ojalvo)*: Molecular mechanisms and functional outcomes of stochastic transcription factor pulsing in Saccharomyces cerevisiae under glucose stress.*

2009-2013 **BSc in Human Biology, UPF** (*Grau en Biologia Humana*).
Bachelor's thesis (Advised by Prof. Jordi Garcia Ojalvo and Dr Nara Guisoni): *Lateral inhibition mediated by Notch signaling in Drosophila intestinal stem cells: analysis of a mathematical model*.
2011-2012: Study Abroad Exchange at **King's College London, UK.**

OTHER RELEVANT COURSES

10/2024 **From science to business.** ESADE, Barcelona.
Introduction to the business world for scientists, especially oriented towards start-up venture creation.

06/2023 **Leading for Success in Science,** Intervals Program, Barcelona Biomedical Research Park.
3-day course on key management and leadership tools for young PIs delivered by HFP consulting.

11/2021 **EMBO Laboratory Leadership Course For Postdocs.**
4-day workshop about key management and leadership tools for scientists delivered by HFP consulting.

OTHER ACADEMIC CERTIFICATES

02/2022 **Report for tenure-track lecturer from AQU Catalunya**
(acreditació professor lector).

PUBLICATIONS

(*equal contribution, +senior authorship)

Academic Articles (original research)

1. Emergence of activation or repression in transcriptional control under a fixed molecular context.
Martinez-Corral R+, Friedrich D, Frömel R, Velten L, Gunawardena J, DePace A H+.
Proceedings of the National Academy of Sciences of the United States of America. 2025 122 (39) e2413715122. DOI: 10.1073/pnas.2413715122.

2. Core splicing architecture and early spliceosomal recognition determine microexon sensitivity to SRRM3/4.
Bonnal S, Bajew S, Martinez-Corral R, Irimia M.
Nature Structural and Molecular Biology. 2025. DOI: 10.1038/s41594-025-01634-1.

3. Design principles of cell-state-specific enhancers in hematopoiesis.
Frömel R, Rühle J, Bernal Martinez A, Szu-Tu C, Pacheco Pastor F, Martinez-Corral R, Velten L.
Cell. 2025. 188, 3202–3218. DOI: 10.1016/j.cell.2025.04.017.
Covered by the popular journal *El Pais*.

4. Biochemically plausible models of habituation for single-cell learning.
Eckert L, Vidal-Saez MS, Zhao Z, Garcia-Ojalvo J, Martinez-Corral R+, Gunawardena J+.
Current Biology. 2024 16;34(24):5646-5658.e3. DOI: 10.1016/j.cub.2024.10.041.
Dispatch. Rajan DF, Marshall WF. 2024. Cellular cognition: How single cells learn using non-neural networks. *Current Biology*. R1221-3.
Broad mass media coverage including El Pais, Ara, and wired.

5. The Hill function is the universal Hopfield barrier for sharpness of input–output responses.
Martinez-Corral R, Nam Kee-Myoung, DePace A H, Gunawardena J.
Proceedings of the National Academy of Sciences of the United States of America. 2024. 121 (22) e2318329121. DOI: 10.1073/pnas.2318329121

6. Transcriptional kinetic synergy: a complex landscape revealed by integrating modelling and synthetic biology.
Martinez-Corral R*, Park M*, Biette K*, Friedrich D, Scholes C, Khalil A S, Gunawardena

J, DePace A H.
Cell Systems. 2023. 14(4):324-339.e7. https://doi.org/10.1016/j.cels.2023.02.003.

7. Allosteric conformational ensembles have unlimited capacity for integrating information
Biddle B*, Martinez-Corral R*, Wong F, Gunawardena J.
eLife, 2021. 10, e65498. DOI: 10.7554/eLife.65498.

8. Metabolic basis of brain-like electrical signalling in bacterial communities.
Martinez-Corral R, Liu J, Prindle A, Süel G M, Garcia-Ojalvo J.
Philosophical Transactions of the Royal Society B. 2019. 374(1774):20180382. DOI: 10.1098/rstb.2018.0382.

9. Self-amplifying pulsatile protein dynamics without positive feedback.
Martinez-Corral R, Raimundez E, Lin Y, Elowitz M B, Garcia-Ojalvo J.
Cell Systems. 2018. 453-462.e1. DOI:10.1016/j.cels.2018.08.012.

10. Bistable emergence of oscillations in growing Bacillus subtilis biofilms.
Martinez-Corral R, Liu J, Süel G M, Garcia-Ojalvo J.
Proceedings of the National Academy of Sciences of the United States of America. 2018. 115(36): E8333-E8340. DOI:10.1073/pnas.1805004115.

11. Diversity of fate outcomes in cell pairs under lateral inhibition.
Guisoni N*, Martinez-Corral R*, Garcia-Ojalvo J, de Navascues J.
Development. 2017. 144(7):1177-1186. DOI:10.1242/dev.137950.

12. Coupling between distant biofilms and emergence of nutrient time-sharing.
Liu J, Martinez-Corral R*, Prindle A*, Lee D Y D, Larkin J, Gabalda-Sagarra M, Garcia-Ojalvo J, Süel G M.
Science. 2017. 356(6338):638-642. DOI:10.1126/science.aah4204.
Broad mass media coverage, including the main Catalan news channel 324, El Periodico, and IFLScience.

Academic Articles (review)

13. The linear framework: using graph theory to reveal the algebra and thermodynamics of biomolecular systems
Nam K-M*, Martinez-Corral R*, Gunawardena R..
Interface Focus, 2022. 12:20220013. DOI:10.1098/rsfs.2022.0013.

14. Modeling cellular regulation by pulsatile inputs.
Martinez-Corral R, Garcia-Ojalvo J.
Current Opinion in Systems Biology. 2017. 3; 23-29. DOI: 10.1016/j.coisb.2017.03.003.

Other publications

15. Retaining postdocs by recognizing their worth.
Yalcin E, Martinez-Corral R, Chugh M.
Nature Biotechnology, 2023. 41:296-298. DOI: 10.1038/s41587-023-01656-4. (Career feature).

GRANTS AND FUNDING

2023-2026 - Proyectos de Generación del Conocimiento 2022. €45,000 (€36,000 direct costs).
Awarded by the Spanish Ministry of Science and Innovation. July 2023.
Project title: Biophysical basis for context-dependency in transcriptional control.

2023-2027 - Ramón y Cajal 2021. RYC2021-033860-I. 5-year salary grant plus startup package.

€236,350. Awarded by the Spanish Ministry of Science and Innovation. July 2022.

2020-2022 - EMBO long-term fellowship 2019. ALTF 683-2019. Salary grant, ~€78,000. Awarded by the European Molecular Biology Organization to support postdoctoral training abroad up to two years.

2014-2018 - Fundació La Caixa Scholarship for PhD studies 2014. Salary grant, €113,500. Awarded by Fundació La Caixa to 25 prospective PhD students in Spain.

Amgen Travel Award, 2017, to participate in the conference "Quantitative Principles in Biology" (EMBL 2-4 November 2017). ~€550. Awarded by the Amgen Foundation to selected alumni from the Amgen Scholars Program.

ACADEMIC PRIZES AND OTHER SELECTED AWARDS

2023 - Antalgenics-SBE33 2023. Awarded by the Spanish Biophysical Society among young scientists (up to 33 years old) for notable contributions in the biophysics field. €500.

2019 - PhD extraordinary award 2018-2019, Universitat Pompeu Fabra.

2013 - Fundació Catalunya-La Pedrera Scholarship for the MSc in Bioinformatics for Health Sciences.

2013 - First Prize, National Prize for Undergraduate Studies 2012-2013 (Premio Nacional Fin de Carrera de Educación Universitaria), Spanish Ministry of Education.

2013 - End of studies Extraordinary Award (Premi Extraordinari Fi d'Estudis) 2012-2013, Universitat Pompeu Fabra.

INVITED TALKS

2025/10. *Net-Quasi Workshop 2 "Mimicking and Reprogramming Life: From Synthetic Cells and Active Matter to Smart Therapeutics"*. Institute of Bioengineering of Catalonia, Barcelona, Spain.
Title: Context-dependency in gene regulation.

2024/01 – *KU Leuven*. Invited talk to the lab and local colleagues of Stein Aerts.
Title: Making sense of thousands of molecules: modelling to understand animal transcription.

2023/06 – XVII International Congress of the Spanish Biophysical Society. (Castelldefels, Spain, 27-30 June 2023). Invited talk to the SBE award ceremony.
Title: The Hill function as the universal limit of sharpness of equilibrium input-output responses.

SELECTED TALKS AT CONFERENCES

07/2025 –Gene Regulation: one molecule at a time. (Heidelberg, Germany, 15-18 July 2025).
Title: Incoherent transcription factor action leads to non-monotonicity and affinity-dependent activation or repression

07/2023 – EMBO Theory and Concepts in Biology. (Heidelberg, Germany, 18-21 July 2023).
Title: A general limit for the sharpness of input-output responses grounds the Hill function in biophysical mechanism.
11/2021 – Genes, Geometry, and Development. Initiative for the Theoretical Sciences (ITS). New York (hybrid) Nov 12, 2021. (invitation to Prof. Angela DePace, extended to myself and our colleague Dr Timothy Harden)
Title: Precision and plasticity in animal development. Recording available at: https://www.youtube.com/watch?v=7AkwvPcMHI8&t=4232s

10/2021 – Physics of Life: Students and Postdocs Edition, Center for the Physics of Biological Function. (Princeton (remote), October 8, 2021).
Tite: Information integration in gene regulation through allostery. Recording available: https://www.youtube.com/watch?v=NhIJHSS2164 (starting time 54:40).

11/2017 – EMBO conference: Quantitative Principles in Biology (Heidelberg, Germany, 2-4 November 2017).
Title: "Oscillatory dynamics in bacterial biofilms".

REVIEWER SERVICE

Journals: Service for Current Biology, PNAS, Biophysical Journal, Journal of the Royal Society Interface, Review commons, PLOS One, eLife.

Grants: Service for the Spanish Research Agency ("Proyectos de Generación del Conocimiento", Agencia Estatal de Investigación)

CONFERENCES ORGANISED

2025 – Scientific co-organiser of the 4th Annual Symposium of the Barcelona Collaboratorium, entitled *Causality in Biology and AI*. Includes preparation of a grant (awarded) to acquire funding from the Barcelona city hall.
2024 – Scientific co-organiser of the 3rd Annual Symposium of the Barcelona Collaboratorium, entitled *Modelling biology across scales*.

STUDENTS MENTORED

Training period	Student Name	Study Program	Project title/topic
06/2025-present	Martí Sanchis Llovera	MSc in Bioinformatics for health sciences, UPF	Modelling the methionine pathway
06/2024-04/2025	Prarabdh Shivhare	IISER Pune trans-disciplianary program (BS/MS)	Modelling Massively Parallel Reporter Assay data through a hybrid mechanistic-deep learning model. MSc thesis, co-mentored with Lars Velten (CRG).
09/2024 -	Konstantina Poumpouridou	PhD Biomedicine, MELIS-UPF & CRG	Bridging theory and AI to dissect alternative splicing regulation.
09/2023-	Giorgio Ravanelli	PhD Biomedicine, MELIS-UPF & CRG	Duality across genomic scales.
07-08/2023 01-06/2024	Daniel Martín López	BSc Human Biology, MELIS-UPF	Sharpness in gene transcription regulation due to molecular competition. BSc thesis.
06/2023-12/2023	Sol Vidal	PhD Biomedicine, MELIS-UPF	Modelling habituation in single cells. Co-supervision of project (not whole thesis) with Prof. Jordi Garcia-Ojalvo.
02/2022-12/2023	Lina Eckert	Master's degree in Interdisciplinary Science, ETH Zürich	Modelling habituation in single cells. Co-supervision of MSc thesis with Prof. Jeremy Gunawardena until Sept. 2023.
09/2021-09/2022	Giorgio Ravanelli	Master's degree in Quantitative Biology, Università degli Studi di Milano	Impact of energy dissipation on gene expression dynamics. Co-supervision of MSc thesis with Prof. Jeremy Gunawardena.

06/2021-01/2022	Varsha Chari	HMS Systems Biology Undergraduate research summer program	Multi-input gene regulation: a theoretical analysis.
06/2020-09/2021	Ziyuan Zhao	Harvard College	Modelling habituation in single cells.
06/2019-09/2020	Sophie Woodward	Harvard College	Role of energy expenditure in the generation of nonmonotonic gene regulation functions.
06-08/2019	Advait Athreya	HMS Systems Biology Undergraduate research summer program	Effect of energy expenditure in gene regulation in the transient regimes.
09/2017-06/2018	Arianne Bercowsky	MSc of Multidisciplinary Research in Experimental Sciences, BIST	Free form modelling for stochastic intermittent data. Co-supervision of MSc thesis with Prof. Jordi Garcia-Ojalvo.
09/2015-07/2016	Elba Raimundez	MSc in Bioinformatics for health sciences, UPF	Pulsatile dynamics in yeast signaling. Co-supervision of MSc thesis with Prof. Jordi Garcia-Ojalvo.

Relevant courses:

Spring 2019	**Harvard Undergraduate Mentoring Workshop Series.** Workshop series aimed at improving undergraduate student mentoring skills.

THESIS ADVISORY COMMITTEES

2024- Student: Silvia González López, CRG.
Advised by: Roderic Guigó and Sílvia Pérez Lluch.
Thesis topic: The role of epigenetic marks in transcriptional regulation during evolution.

2025- Student: Júlia Vicens Figueres, UPF.
Advised by: Jordi Garcia-Ojalvo.
Thesis topic: Collective bacterial dynamics under stress

EVALUATION PANELS

09/2025 PhD thesis jury of Jhoan Sebastian Ortiz Giron. UPF, Spain.
Thesis title: Resolving the continuous high-order organization of the exocyst during vesicle tethering.
Advisor: Oriol Gallego

06/2024 PhD thesis jury of Maria Costanzo, EMBL/UPF, Spain.
Thesis title: *"Somitogenesis unbound". Dissecting the spatiotemporal control of mammalian embryo segmentation through in vitro models of development.*
Advisor: Miki Ebisuya

06/2024 PhD thesis jury of Alda Sabalic, UPF, Spain.
Thesis title: *Systems biology perspectives on cellular senescence and inflammation.*

Advisor: Jordi Garcia-Ojalvo

11/2023 PhD thesis jury of Miguel Báez Martín, U. de Cantabria, Spain.
Thesis title: *Information Processing in Synthetic Gene Circuits*.
Advisor: Raúl Fernández López

07/2023 Panel member for BSc theses of the BSc in Biomedical Engineering, UPF.

TEACHING EXPERIENCE

Date	Course name, degree name, institution	Number students / teaching hours	Other
Spring 2023, 2024, 2025	Evolutionary Algorithms, BSc Biomedical Engineering, MELIS-UPF	~40-50 students / 20 h per year	Course coordinator. Designed and taught jointly with Prof. Oscar Lao (IBE-CSIC).
Fall 2018	Systems and Network Biology, BSc Bioinformatics, ESCI-UPF	~20 students / 20 h	Joint course design and teaching together with Prof. Jordi Garcia Ojalvo. Lectures and computer labs.
09/2018	Introductory week of Bioinformatics degree, ESCI-UPF	~30 students / 4 h	Introduction to programming workshop, introductory week organized by Dr. Hafid Laayouni.
07/2018	Campus Junior (high school summer camp), MELIS-UPF	~20 students / 5h	Introduction to programming and modelling workshop.
Fall 2016, 2017, 2018	Basic sciences I (mathematics) BSc Human Biology, MELIS-UPF	~60 students / 18 h (2016) 18 h (2017) 36 h (2018)	Computer labs of the course, together with Aina Ollé Vila. Main professor: Prof. Javier Macia Santamaria.
Spring 2015	Biocomputing, BSc Biomedical Engineering, MELIS-UPF	~20 students / 7 h	Participant teaching assistant for the computer labs of the course. Main professor: Jordi Garcia Ojalvo.
Fall 2014, 2015, 2016	Systems biology, BSc Biomedical Engineering, MELIS-UPF	~40 students / 8 h (2014) 20 h (2015) 20 h (2016)	Participant teaching assistant for the computer labs of the course. Main professor: Jordi Garcia Ojalvo.

LEADERSHIP ACTIVITIES BEYOND MY CURRENT POSITION AS PI:

Harvard Medical Postdoc Association: Advocacy committee member (2021-2022), Chair of the governing board (2020-2021) and Treasurer (2019-2020) of this volunteer-based, postdoc-run organization that works alongside the Harvard Medical School postdoc office to improve the postdoctoral experience at Harvard Medical School.

La Facultad Invisible: Co-organizer of the Mentoring project for university students during the year 2019-2020. La Facultad Invisible is a Spanish association founded by recipients of the National Prize for Undergraduate Education, that aims to improve the Spanish higher education system.

SCIENTIFIC OUTREACH

Outreach activities with schools in Barcelona and in Boston (participation in the Calculus Project at Harvard Medical School). Participation in multiple editions of the Barcelona Biomedical Research Park Open Day. 2014-2018: Collaboration with the blog "Minuta" (Spanish/Catalan), "REDCEDAR" (English) and "Ellipse" journal (https://ellipse.prbb.org/).