

Violeta Calleja Solanas, Postdoctoral Research Associate

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EDUCATION & RESEARCH EXPERIENCE

Postdoctoral Research Associate, Department of Ecology and Evolution, Doñana Biological Station, CSIC, Spain.

Lab: Oscar Godoy

Timeline: 01/11/2023 - Present

PhD in Physics of Complex Systems, Institute of Cross-Disciplinary Physics and Complex Systems (IFISC-CSIC), Spain.

Thesis title: Exploring ecological and social interactions through the lens of complex systems

Supervisors: Emilio Hernández García and Sandro Meloni

Merit: Excelente Cum Laude

Timeline: 1/12/2018, PhD defended: 19/07/2023

Research Stay: 19/09/2021 - 31/12/2021 Laboratory of Interdisciplinary Physics, University of Padova, **Italy**. Working with: Samir Suweis

MSc in Physics and Physical Technologies, University of Zaragoza, Spain 09/2017 - 06/2018

Thesis title: Higher-order versus structured interactions in competitive ecosystems

Supervisors: Sandro Meloni and Jesús Gómez-Gardeñes

Score: 9.8/10 Outstanding

BSc in Physics, University of Zaragoza, Spain 09/2012 - 06/2017

PUBLICATIONS

In peer-reviewed journals and forthcoming: (* senior author)

1. **Calleja-Solanas V.**, Moura RO., Langa JA., Soler-Toscano F., Portillo JR., Godoy O. (2025), A general framework for cycles in ecology. *bioRxiv* <https://doi.org/10.1101/2025.01.13.632680> (*in press* in Ecology)
2. **Calleja-Solanas V.**, Bartomeus I., Godoy O. (2025), Time-varying interactions drive species coexistence via rainfall variation. *bioRxiv* <https://doi.org/10.1101/2025.11.28.690940> (under revision in Ecology Letters)
3. Godoy O., **Calleja-Solanas V.**, Soler-Toscano F., Portillo JR., Suárez A., Langa JA. (2025), Cooperation maximizes biodiversity. *bioRxiv* <https://doi.org/10.1101/2024.10.22.619656> (*in press* in The American Naturalist)
4. Gómez-Ambrosi C., **Calleja-Solanas V.*** (2025), Measuring net effects in signed ecological and social networks. *arXiv* <https://doi.org/10.48550/arXiv.2501.09190> (under review in Scientific Reports)

5. Durán-Sala M., Meloni S., **Calleja-Solanas V.* (2025)**, On the stability of competitive ecological communities with pairwise and higher-order interactions. *arXiv* <https://doi.org/10.48550/arXiv.2501.09172>
6. Caligiuri A., Emery E., Ferreira L., García-Castillo J., Lindner SD., Molina-Hernández J., Reis de Almeida N., Hugo V., Sartore M., Wang B., **Calleja-Solanas V.* (2025)**, Time-varying ecological interactions characterise equilibrium and stability. *arXiv* <https://doi.org/10.48550/arXiv.2506.22123>
7. **Calleja-Solanas V.**, Khalil N., Hernández-García E., Gómez-Gardeñes J., Meloni S. (2022), Structured interactions as a stabilizing mechanism for competitive ecosystems. *Phys. Rev. E* 106, 064307 <https://doi.org/10.1103/PhysRevE.106.064307>
8. Plata CA., Pigani E., Azaele S., **Calleja-Solanas V.**, Palazzi MJ., Solé-Ribalta A., Borge-Holthoefer J., Meloni S., Suweis S. (2021), Neutral theory for competing attention in social networks. *Phys. Rev. Research* 3, 013070 <https://doi.org/10.1103/PhysRevResearch.3.013070>
9. **Calleja-Solanas V.**, Pigani E., Palazzi MJ., Solé-Ribalta A., Suweis S., Borge-Holthoefer J., Meloni S. (2021), Quantifying the drivers behind collective attention in information ecosystems. *Journal of Physics: Complexity* 2, 045014 <https://doi.org/10.1088/2632-072X/ac35b6>
10. Palazzi MJ., Solé-Ribalta A., **Calleja-Solanas V.**, Meloni S., Plata CA., Suweis S., Borge-Holthoefer J. (2021), An ecological approach to structural flexibility in online communication systems. *Nature Communications* 12, 1941 <https://doi.org/10.1038/s41467-021-22184-2>

ORGANISATION OF CONFERENCES & OTHER ACADEMIC SERVICES

Elected Council member of the Spanish Complex Systems Society, CS3 (2025-2027).
Elected Council member of the Complex Systems Society, CCS (2021-2024).
Elected Chair of the yrCCS (2022-2023).
Elected Board member of the Young Researchers of the Complex Systems Society, yrCCS (2021).

Conference Chair at the Spanish Complex Systems Society Conference, Seville, Spain, 2026.
Co-founder and co-organiser of 2 editions of the Spanish Conference of Statistical Physics for Young Researchers (FisEs Joven 2021 and 2023).
Co-organisation of 2 Warm-Up Schools at CCS 2021 and 2022.
Organisation committee member at CCS 2022.
Scientific committee member in 6 international (CCS 2022, 2023, 2024, 2025, and CompleNet 2025, 2026) and 5 national (CS3 2024, 2025, 2026, and FisEs Joven 2021, 2023) conferences.

Seminar series co-organiser at Doñana Biological Station, 2025.
Workshop co-organiser “Workshop on structural stability”, Doñana Biological Station, April 2024.

Peer reviewer: Ecology Letters, PLOS Computational Biology, Nature Communications Physics, Oikos x3, and Philosophical Transactions A.

PhD Dissertation Committee: x1 (Dr Somaye Sheykhal, November 20, 2025, IFISC).

Panel Co-organiser and Moderator: “Challenges for young researchers: from mental health to precariousness”, CCS 2022.

Memberships: Spanish Association of Terrestrial Ecology (AEET), Complex Systems Society (CSS), Spanish Complex Systems Society (CS3).

INVITED SEMINARS

1. Mission and Initiatives of young researchers of complex systems. Round Table panelist (2021) at the Conference on Complex Systems, Lyon, France, **invited by Bertrand Jouve**.
2. Temporal variability in species interaction networks. Invited seminar (2024) at CX talks, Aalto University, online, **invited by Abbas Rizzi**.
3. Ecological coexistence through the lens of temporal and spatial interactions. Invited talk (2025) at Instituto Pirenaico de Ecología (IPE-CSIC), Spain, **invited by Graciela Gil-Romera**.
4. Effects of deterministic and stochastic sources on coexistence opportunities. Invited talk (2025) at Workshop on Information and Dynamics in Complex Ecological Models, Spain, **invited by José Antonio Langa**.
5. Time-varying ecological interactions: why, how, and what. Invited seminar (2025) **invited by Women in Network Science**, [online](#).
6. The effect of temporal variability of species interactions on stability. Invited seminar (2025) at the International Initiative for Theoretical Ecology (IITE) seminar series, [online](#), **invited by Chris Terry**.
7. Community assembly in an ever-changing world. Invited seminar (2025) for IFISC seminar series, Spain, **invited by Juan Fernández-García**.

TEACHING AND MENTORING

MSc. thesis co-supervisor: Ecological Patterns in Online Social Interactions | Student: Veronica Bedin | Grade: Outstanding, with Samir Suweis and Sandro Meloni at the MSc. on Physics of Data, University of Padua, Italy, 2025.

MSc. thesis co-supervisor: Higher-order interactions as stabilising mechanism for competitive communities | Student: Marc Durán-Sala, secured a PhD at EPFL | Grade: Outstanding, with Sandro Meloni at the MSc. on Complex Systems, IFISC, Spain, 2023.

BSc. thesis co-supervisor: The quasispecies model in the reducible case | ongoing with Carlos Gómez-Ambrosi at the BSc. in Mathematics, University of Zaragoza, Spain, 2025.

Lecturer: “Introduction to Structural Stability in Ecology” (3h), 2 June 2025, during workshop for *III SIBECOL & XVII AEET Meeting*, Spain, developing Shiny [apps](#) of assembly graphs.

Elected Tutor leading the project “Temporal dynamics of ecological interaction networks and their implications for stability” at the workshop for PhD students *Complexity72h*, Spain, 23-27 June 2025.

ORAL PRESENTATIONS AT CONFERENCES (10)

- Drivers of biodiversity loss under an ever-changing world. *ECONET VII Symposium on ecological networks*, Newcastle, 2025.
- Extreme changes in precipitation drive biodiversity loss. *III SIBECOL & XVII AEET Meeting*, Pontevedra, 2025.
- Stochastic and deterministic drivers of temporal variability in species interactions. *Stochastic Models and Experiments in Ecology and Biology Conference*, Italy, 2024.

- Quantifying the drivers behind collective attention in information ecosystems. *Conference on Complex Systems (CCS)*, Palma de Mallorca, **2022**.
- Structural Predictors for Species Survival. *Young Modellers in Ecology Workshop*, online, **2022**.
- Structural Predictors for Species Survival in Ecological Networks. *Conference on Complex Systems*, Lyon, **2021**.
- Structural Predictors for Species Survival in Ecological Networks. *ECONET V Symposium on ecological networks*, Palma de Mallorca, **2021**.
- Structured interactions in competitive ecological systems. *NETSCI International School and Conference on Network Science*, online, **2020**.
- High-order vs. structured interactions in competitive ecosystems. *Conference on Complex Systems*, Singapore, **2019**.
- Chaotic circuits simulation and implementation with applications to secure communications. *7th Conference for Young Researchers on Physics and Chemistry*, Zaragoza, **2016**.

POSTER PRESENTATIONS AT CONFERENCES (4)

- Universal patterns in information ecosystems. *XXIII National Conference of Statistical Physics FisEs'22*, Zaragoza, **2022**.
- Neutral theory for competing attention in social networks, *Conference on Complex Systems*, Lyon, **2021**.
- Structured interactions in competitive ecosystems, *International Conference on Complex Networks (CompleNet)*, Tarragona, **2019**.
- Higher-order vs. structured interactions in competitive ecosystems, *XXII National Conference of Statistical Physics FisEs'18*, Madrid, **2018**.

FUNDING

Conference organization	Severo Ochoa call for conference organization CEX2024-001498-S	1.000 €
PhD scholarship	Maria de Maeztu program for Units of Excellence (Grant No. MDM2017-0711) funded by MCIN/AEI/10.13039/501100011033	70.000 €
PhD scholarship	Competitive Govern of Balearic Islands' FPI, Grant No. FPI/2257/2019 Conv. 201, 2019	88.284 €
PhD mobility grant	EDUIB-Banco Santander 2021	4.000 €
MSc training	Becas talento mujer Banco Santander 2018	2.100 €

AWARDS

5 Best Poster Awards at FisEs'22, and CompleNet 2019 conferences, outreach IFISC Poster Party 2019 and 2020, and Postgraduate week University of the Balearic Islands 2019.

Data visualisation contest winner at CCS Warm-Up 2020.

Elected participant at VII ed. of the Santander Bank Entrepreneur Program (Feb - Apr 2017).

Finalist in the XXIII Physics Olympiad Aragon Phase 2012.

PHD TRAINING, as elected participant

- Winter Workshop on Complex Systems, 21-26 Jan 2024, Catalan Pyrenees, Spain.
- INTP Autumn School: Syntheses in Theoretical Community Ecology, 3-8 October 2022, France.
- **Santa Fe Institute's Complex Systems Summer School** (SFI-CSSS), 12 Jun - 8 Jul 2022, USA.
- 'Fundamental Mathematical Models in Evolution', PhD-training course by Eric Libby, Umeå University, April - May 2021.
- Scientific Evolutionary Writing Workshop, Università di Roma Sapienza, 1- 4 March 2021.
- Winter School on Quantitative Systems Biology: Quantitative Approaches in Ecosystem Ecology, by the International Centre for Theoretical Physics (ICTP), 30 Nov - 18 Dec 2020.

RESEARCH PROJECTS, as participant

TASTE: The effect of temporal variability of species interactions on the stability and functioning of ecosystems. PI: O.Godoy 127607OB-I00 MINECO, Spain. Contribution: Leading 1 publication about the temporal effects of drought on interactions and community structural stability.

APASOS: A Physics approach to sociotechnical systems: from theory to data analysis. Plan Nacional 2021, PI: S. Meloni & T. Galla, 375.000 €, 122256 MINECO, Spain. Contribution: Team member leading 1 publication about macro-ecological patterns in information ecosystems.

PACSS Physics approach to complexity in sociotechnical systems. Plan Nacional 2019, PI: S.Meloni et al. 093732 MINECO, Spain. Contribution: Leading 1 publication about the ecology of temporal events in online social interactions using empirical data.

OUTREACH ACTIVITIES

Participating researcher at the **International Day of Women and Girls in Science** (2018, 2020, 2021), **European Researchers Night** 2024, 2025, **“Feria de la Ciencia”** Sevilla 2024.

Community manager of social media accounts for yrCCS (+5K) and CCS Palma 2022 (+1K).

Outreach [video](#) “¿Qué son los algoritmos genéticos?” IFISC YouTube channel, 2019.

Volunteer at the Museum of Natural Sciences of University of Zaragoza (2020-2021), the University of Zaragoza Classical Orchestra (2017-2018), and the Educational Museum of Origami (2017-2018).