

Juan Diaz-Colunga, Ph.D.

Postdoctoral Researcher
Institute of Functional Biology & Genomics (IBFG-CSIC)
University of Salamanca

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Research interests Ecology & Evolution, Population Genetics, Biophysics, Systems Biology

Education

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| Ph.D. Biophysics Spanish National Center for Biotechnology (CNB-CSIC) | Madrid, Spain 2015 – 2019 |
| M.Sc. Biomedical Engineering Universidad Politecnica de Madrid | Madrid, Spain 2013 – 2014 |
| B.Sc. Physics Universidad Autonoma de Madrid | Madrid, Spain 2009 – 2013 |

Honors and fellowships

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| PhD <i>cum laude</i> with international mention | 2019 |
| Severo Ochoa PhD Fellowship | 2015 – 2019 |
| Severo Ochoa Travel Grant (for 6-month stay at MIT) | 2018 |
| Comunidad de Madrid Excellence Undergraduate Fellowship | 2009 – 2013 |

Research experience

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| Postdoctoral Researcher University of Salamanca, Institute of Functional Biology & Genomics Advisor: Prof. Alvaro Sanchez | 2019 – Present 2023 – Present |
| Yale University, Dept. of Ecology & Evolutionary Biology Advisors: Prof. Alvaro Sanchez & Prof. C. Brandon Ogbunugafor | 2020 – 2022 |
| Universidad Autonoma de Madrid, Dept. of Biochemistry Advisor: Prof. Ramon Diaz-Uriarte | 2019 – 2020 |
| Visiting PhD Fellow Massachusetts Institute of Technology (MIT) Physics of Living Systems dept. Advisor: Prof. Jeff Gore | 2018 |
| PhD Fellow Spanish National Center for Biotechnology (CNB-CSIC) Dept. of Cellular and Molecular Biology Advisors: Dr. Francisco J. Iborra & Prof. Raul Guantes | 2015 – 2019 |

Publications

* (co-)first author
✉ (co-)corresponding author

Environmental modulation of global epistasis in a drug resistance fitness landscape
Juan Diaz-Colunga * ✉, Alvaro Sanchez, C. Brandon Ogbunugafor
Nature Communications (in press) (2023)

Global epistasis and the emergence of ecological function

Juan Diaz-Colunga * ✉, Abigail Skwara, Jean CC Vila, Djordje Bajic, Álvaro Sánchez
bioRxiv (2023)

Statistically learning the functional landscape of microbial communities

Abigail Skwara, Karna Gowda, Mahmoud Yousef, Juan Diaz-Colunga, Arjun S Raman,
Alvaro Sanchez, Mikhail Tikhonov, Seppe Kuehn
Nature Ecology & Evolution **7**:1823—1833 (2023)

Global epistasis on fitness landscapes

Juan Diaz-Colunga * ✉, Abigail Skwara, Karna Gowda, Ramon Diaz-Uriarte, Mikhail
Tikhonov, Djordje Bajic, Alvaro Sanchez
Philosophical Transactions of the Royal Society B **378**:20220053 (2023)

The community-function landscape of microbial consortia

Alvaro Sanchez, Djordje Bajic, Juan Diaz-Colunga *, Abigail Skwara, Jean CC Vila,
Seppe Kuehn
Cell Systems **14**(2):122–34 (2023)

Predictability of the community-function landscape in wine yeast ecosystems

Javier Ruiz, Miguel de Celis, Juan Diaz-Colunga, Jean CC Vila, Belen Benitez-
Dominguez, Javier Vicente, Antonio Santos, Alvaro Sanchez, Ignacio Belda
Molecular Systems Biology **19**(9):e11613 (2023)

Top-down and bottom-up cohesiveness in microbial community coalescence

Juan Diaz-Colunga *, Nanxi Lu, Alicia Sanchez-Gorostiaga, Chang-Yu Chang, Helen
S Cai, Joshua E Goldford, Mikhail Tikhonov, Álvaro Sánchez
Proceedings of the National Academy of Sciences **119**(6):e2111261119 (2022)

Diversity begets diversity under microbial niche construction

Sylvie Estrela, Juan Diaz-Colunga *, Jean CC Vila, Alicia Sanchez-Gorostiaga, Alvaro
Sanchez
eLife (accepted) (2022)

Engineering complex communities by directed evolution

Chang-Yu Chang, Jean CC Vila, Madeline Bender, Richard Li, Madeleine C
Mankowski, Molly Bassette, Julia Borden, Stefan Golfier, Paul Gerald L Sanchez,
Rachel Waymack, Xinwen Zhu, Juan Diaz-Colunga, Sylvie Estrela, Maria Rebolleda-
Gomez, Alvaro Sanchez
Nature Ecology & Evolution **5**(7):1011–23 (2021)

Directed evolution of microbial communities

Álvaro Sánchez, Jean CC Vila, Chang-Yu Chang, Juan Diaz-Colunga, Sylvie Estrela,
María Rebolleda-Gomez
Annual Review of Biophysics **50**:323–41 (2021)

Conditional prediction of consecutive tumor evolution using cancer progression models: What genotype comes next?

Juan Diaz-Colunga *, Ramon Diaz-Uriarte
PLOS Computational Biology **17**(12):e1009055 (2021)

Osmotic modulation of chromatin impacts on efficiency and kinetics of cell fate modulation

Ana F Lima, Gillian May, Juan Diaz-Colunga, Susana Pedreiro, Artur Paiva, Luciana Ferreira, Tariq Enver, Francisco J Iborra, Ricardo Pires das Neves
Scientific Reports **8(1)**:1–14 (2018)

Mitochondrial levels determine variability in cell death by modulating apoptotic gene expression

Silvia Márquez-Jurado, Juan Diaz-Colunga *, Ricardo Pires das Neves, Antonio Martinez-Lorente, Fernando Almazán, Raúl Guantes, Francisco J Iborra
Nature Communications **9(1)**:1–11 (2018)

Epigenetic control of influenza virus: role of H3K79 methylation in interferon-induced antiviral response

Laura Marcos-Villar, Juan Diaz-Colunga, Juan Sandoval, Noelia Zamarreño, Sara Landeras-Bueno, Manel Esteller, Ana Falcón, Amelia Nieto
Scientific Reports **8(1)**:1–13 (2018)

Mitochondria and the non-genetic origins of cell-to-cell variability: more is different

Raúl Guantes, Juan Diaz-Colunga, Francisco J Iborra
BioEssays **38(1)**:64–76 (2016)

Selected talks

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| IBFG Seminar Series | 2023 |
| Institute for Functional Biology and Genomics (IBFG-CSIC) Salamanca, Spain Title: <i>Design strategies for microbial communities</i> | |
| CAB Conference: | 2022 |
| Microbial Communities at the Interface between Ecology and Evolution | |
| Mexico City, Mexico Title: <i>Design strategies for microbial communities: searching for functional maxima in ecological landscapes</i> | |
| XXIX Workshop: Advances in Molecular Biology | 2021 |
| Spanish National Center for Biotechnology (CNB-CSIC) Virtual seminar Title: <i>Engineering microbial communities with global epistasis</i> | |
| Evolutionary & Ecological Systems Biology Talks | 2021 |
| Massachusetts Institute of Technology (MIT) Virtual seminar Title: <i>Top-down and bottom-up co-selection in microbial community coalescence</i> (invited talk) | |
| Physics of Living Systems Seminar Series | 2018 |
| Massachusetts Institute of Technology (MIT) Cambridge, USA Title: <i>The energy cost of living and dying</i> | |

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| | <p>Quantitative Principles in Biology 2017 European Molecular Biology Laboratory (EMBL) Heidelberg, Germany Title: <i>Mitochondrial regulation of extrinsic apoptosis</i></p> |
| | <p>CNB Seminar Series 2016 Spanish National Center for Biotechnology (CNB-CSIC) Madrid, Spain Title: <i>Can we predict apoptosis?</i></p> |
| Teaching | <p>Senior Thesis Supervisor 2023 B.Sc. Final Research Project, Universidad Complutense de Madrid</p> <p>Senior Thesis Supervisor 2021 EEB Senior Research (EEB475 & 476), Yale University</p> <p>Teaching Assistant 2019 M.Sc. Experimental Methods in Biophysics, Universidad Autonoma de Madrid</p> |
| Reviewing activity | <p>Review Editor for <i>Frontiers in Synthetic Biology</i></p> <p>Reviewer for <i>Nature Communications</i>, <i>The ISME Journal</i>, <i>eLife</i>, <i>Philosophical Transactions of the Royal Society B</i>, <i>PLOS Computational Biology</i>, <i>mSystems</i></p> |
| Skills | <p>Programming: R, Python, Matlab Wet lab: General microbiology techniques Languages: English (fluent), Spanish (native), German (basic)</p> |
| Other interests | <p>Coach for high school & elementary school basketball teams Retirement home volunteer General interest in scientific outreach & education</p> |