

Juan Diaz-Colunga, Ph.D.

Postdoctoral Researcher
Institute of Functional Biology & Genomics (IBFG-CSIC)
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Research interests | Ecology & Evolution, Population Genetics, Biophysics, Systems Biology

Education

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

Honors and fellowships

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

Postdoctoral Researcher University of Salamanca, Institute of Functional Biology & Genomics Advisor: Prof. Alvaro Sanchez	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	Global epistasis and the emergence of function in microbial consortia Juan Diaz-Colunga * ✉, Abigail Skwara, Jean CC Vila, Djordje Bajic, Álvaro Sánchez <i>Cell</i> 187 :1–12 (2024)
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Full factorial construction of synthetic microbial communities

Juan Diaz-Colunga *, Pablo Catalan, Magdalena San Roman, Andrea Arrabal, Alvaro Sanchez
bioRxiv (2024)

Global epistasis in plasmid-mediated antimicrobial resistance

Javier DelaFuente, Juan Diaz-Colunga *, Alvaro Sanchez, Alvaro San Millan
Molecular Systems Biology **20(4)**:311–20 (2024)

The optimization of microbial functions through rational environmental manipulations

Álvaro Sánchez, Andrea Arrabal, Magdalena San Román, Juan Diaz-Colunga
Molecular Microbiology **00**:1–10 (2024)

Environmental modulation of global epistasis in a drug resistance fitness landscape

Juan Diaz-Colunga * ✉, Alvaro Sanchez, C. Brandon Ogbunugafor
Nature Communications **14**:8055 (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**Scientific Spring Meeting of the Royal Dutch Society of Microbiology**

2024

Arnhem, the Netherlands

Title: *Rational bottom-up design of complex microbial consortia* (invited talk)

Industrial Microbiology Seminar Series

2024

Delft University of Technology

Delft, the Netherlands

Title: *Rational bottom-up design of complex microbial consortia* (invited talk)

17th Meeting of the Spanish National Network of Lactic Acid Bacteria León, Spain Title: <i>Rational design of microbial communities</i> (invited talk)	2024
IBFG Seminar Series Institute for Functional Biology and Genomics (IBFG-CSIC) Salamanca, Spain Title: <i>Design strategies for microbial communities</i> (invited talk)	2023
CAB Conference: 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>	2022
XXIX Workshop: Advances in Molecular Biology Spanish National Center for Biotechnology (CNB-CSIC) Virtual seminar Title: <i>Engineering microbial communities with global epistasis</i>	2021
Evolutionary & Ecological Systems Biology Talks Massachusetts Institute of Technology (MIT) Virtual seminar Title: <i>Top-down and bottom-up co-selection in microbial community coalescence</i> (invited talk)	2021
Physics of Living Systems Seminar Series Massachusetts Institute of Technology (MIT) Cambridge, USA Title: <i>The energy cost of living and dying</i>	2018
Quantitative Principles in Biology European Molecular Biology Laboratory (EMBL) Heidelberg, Germany Title: <i>Mitochondrial regulation of extrinsic apoptosis</i>	2017
CNB Seminar Series Spanish National Center for Biotechnology (CNB-CSIC) Madrid, Spain Title: <i>Can we predict apoptosis?</i>	2016

Teaching

Senior Thesis Supervisor B.Sc. Final Research Project, Universidad Complutense de Madrid	2023
Senior Thesis Supervisor EEB Senior Research (EEB475 & 476), Yale University	2021
Teaching Assistant M.Sc. Experimental Methods in Biophysics, Universidad Autonoma de Madrid	2019

Reviewing activity	Review Editor for <i>Frontiers in Synthetic Biology</i>	2024 – present
	Project Reviewer for the French National Research Agency (ANR)	2024
	Reviewer for <i>Nature Communications</i> , <i>The ISME Journal</i> , <i>eLife</i> , <i>Nature Cities</i> , <i>Philosophical Transactions of the Royal Society B</i> , <i>PLOS Computational Biology</i> , <i>mSystems</i>	
Skills	Programming: R, Python, Matlab Wet lab: General microbiology laboratory techniques Languages: English (fluent), Spanish (native), German (basic)	
Other interests	Coach for high school & elementary school basketball teams Retirement home volunteer General interest in scientific outreach & education	