

Juan Diaz-Colunga, Ph.D.

Junior Group Leader — Microbial Systems Biology Lab (MSBlab)
Dairy Products Institute of Asturias (IPLA)
Spanish National Research Council (CSIC)

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

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

Awards and fellowships	“Ramon y Cajal” Fellowship	2024
	→ Top-2 ranked candidate in the area of Biosciences and Biotechnology	
	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: Undergraduate Excellence Fellowship	2009 – 2013

Research experience	Junior Group Leader	
	Asturian Institute of Lactic Products, Spanish National Research Council	2025 – now
	Postdoctoral Scientist	
	University of Salamanca, Institute of Functional Biology & Genomics	2023 – 2024
	Yale University, Dept. of Ecology & Evolutionary Biology	2020 – 2022
	Universidad Autonoma de Madrid, Dept. of Biochemistry	2019 – 2020
	Visiting Scholar	
	Massachusetts Institute of Technology (MIT), Physics of Living Systems dept.	2018
	PhD Fellow	
	Spanish National Center for Biotechnology (CNB-CSIC), Dept. of Cellular and Molecular Biology	2015 – 2019

Publications	Towards synthetic ecology: strategies for the optimization of microbial community functions	
	Magdalena San Roman, Andrea Arrabal, Belen Benitez-Dominguez, Isabel Quiros-Rodriguez, Juan Diaz-Colunga ✉	
	<i>Frontiers in Synthetic Biology</i> 3 :1532846 (2025)	
	Global epistasis and the emergence of function in microbial consortia	
	Juan Diaz-Colunga * ✉, Abigail Skwara, Jean CC Vila, Djordje Bajic, Álvaro Sánchez	

Cell **187**:1–12 (2024)

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

Full factorial construction of synthetic microbial communities

Juan Diaz-Colunga *, Pablo Catalan, Magdalena San Roman, Andrea Arrabal, Alvaro Sanchez
eLife **13**:RP101906 (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, [...], 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**EPFL Workshop: Evolution by Nature and by Design**

2024

École Polytechnique Fédérale de Lausanne, Switzerland

Invited talk

EMBO Workshop: Molecular mechanisms in evolution and ecology

2024

European Molecular Biology Laboratory (EMBL), Heidelberg, Germany

Invited talk

Scientific Spring Meeting of the Royal Dutch Society of Microbiology

2024

Arnhem, the Netherlands

Invited talk

Industrial Microbiology Seminar Series

2024

Delft University of Technology, the Netherlands

Invited talk

17th Meeting of the Spanish National Network of Lactic Acid Bacteria

2024

University of León, Spain

Invited talk – keynote speaker

	IBFG Seminar Series Institute for Functional Biology and Genomics (IBFG-CSIC), Salamanca, Spain <i>Invited talk</i>	2023
	CAB Conference: Microbial Communities at the Interface between Ecology and Evolution Mexico City, Mexico	2022
	XXIX Workshop: Advances in Molecular Biology Spanish National Center for Biotechnology (CNB-CSIC), virtual seminar	2021
	Evolutionary & Ecological Systems Biology Talks Massachusetts Institute of Technology (MIT), virtual seminar <i>Invited talk</i>	2021
	Physics of Living Systems Seminar Series Massachusetts Institute of Technology (MIT), Cambridge, USA	2018
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> Project Reviewer for the French National Research Agency (ANR) Reviewer for <i>PNAS</i> , <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>Global Change Biology</i> , <i>PLOS Computational Biology</i> , <i>mSystems</i>	2024 – present 2024
Skills	Programming: R, Python, Matlab Wet lab: General microbiology laboratory techniques Languages: English (fluent), Spanish (native), German (basic)	
Outreach & service	Participant & organizer at various scientific outreach activities (most recent: <i>Science Week 2024</i> , Madrid, Spain; <i>Pint of Science 2025</i> , Salamanca, Spain) Member of the Committee for Gender Equality at IBFG-CSIC Founder of the Commission for Cultural Activities at IBFG-CSIC	