Juan Diaz-Colunga, Ph.D.

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

Education

Ph.D. Biophysics — Madrid, Spain
Spanish National Center for Biotechnology (CNB-CSIC) — 2015 – 2019

M.Sc. Biomedical Engineering — Madrid, Spain
Universidad Politecnica de Madrid — 2013 – 2014

B.Sc. Physics — Madrid, Spain
Universidad Autonoma de Madrid — 2009 – 2013

Honors and fellowships

PhD *cum laude* — 2019
Severo Ochoa PhD Fellowship — 2015 – 2019
Severo Ochoa Travel Grant (for 6-month stay at MIT) — 2018
Comunidad de Madrid Undergraduate Fellowship — 2009 – 2013

Research experience

Postdoctoral Associate — 2020 – Present
Yale University
Dept. of Ecology & Evolutionary Biology
Advisors: Prof. Alvaro Sanchez & Prof. C. Brandon Ogbunugafor

Postdoctoral Researcher — 2019 – 2020
Universidad Autonoma de Madrid
Dept. of Biochemistry, School of Medicine
Advisor: Prof. Ramon Diaz-Uriarte

Visiting PhD Fellow — 2018
Massachusetts Institute of Technology (MIT)
Physics of Living Systems dept.
Advisor: Prof. Jeff Gore

PhD Fellow — 2015 – 2019
Spanish National Center for Biotechnology (CNB-CSIC)
Dept. of Cellular and Molecular Biology
Advisors: Dr. Francisco J. Iborra & Prof. Raul Guantes

Publications

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

Environmental modulation of global epistasis is governed by effective genetic interactions
Juan Diaz-Colunga ∗ ✉, Alvaro Sanchez, C. Brandon Ogbunugafor
bioRxiv (2022)

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: Biological Sciences (2022) [accepted]

The community-function landscape of microbial consortia
Alvaro Sanchez, Djordje Bajic, Juan Diaz-Colunga, Abigail Skwara, Jean CC Vila, Seppe Kuehn
EcoEvoRxiv (2022) [accepted & pending publication in *Cell Systems*]

Emergent ecosystem functions follow simple quantitative rules
Juan Diaz-Colunga ∗, Abigail Skwara, Jean CC Vila, Djordje Bajic, Álvaro Sánchez
bioRxiv (2022)

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
bioRxiv (2022)

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)

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)

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

CAB Conference: 2022
Microbial Communities at the Interface between Ecology and Evolution
Mexico City, Mexico
Title: *Design strategies for microbial communities: searching for functional maxima in ecological landscapes*

XXIX Workshop: Advances in Molecular Biology 2021
Spanish National Center for Biotechnology (CNB-CSIC)
Virtual seminar
Title: *Engineering microbial communities with global epistasis*

Evolutionary & Ecological Systems Biology Talks 2021
Massachusetts Institute of Technology (MIT)
Virtual seminar
Title: *Top-down and bottom-up co-selection in microbial community coalescence* (invited talk)

Physics of Living Systems Seminar Series 2018
Massachusetts Institute of Technology (MIT)
Cambridge, USA
Title: *The energy cost of living and dying*

Quantitative Principles in Biology 2017
European Molecular Biology Laboratory (EMBL)
Heidelberg, Germany
Title: *Mitochondrial regulation of extrinsic apoptosis*

CNB Seminar Series 2016
Spanish National Center for Biotechnology (CNB-CSIC)
Madrid, Spain
Title: *Can we predict apoptosis?*

Teaching

Senior Thesis Supervisor 2021
Course: EEB Senior Research (EEB475 & 476)
Yale University
Student: Jack Softchek
Thesis title: *Global Epistasis & Predicting the Function of Microbial Communities*

Teaching Assistant 2019
Course: Experimental Methods in Biophysics (M.Sc. Biophysics)
Universidad Autonoma de Madrid

Reviewing activity

Nature Communications, eLife, Philosophical Transactions of the Royal Society B: Biological Sciences, PLOS Computational Biology, mSystems

Skills

Programming: R, Python, Matlab
Wet lab: General microbiology 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