David C. Garcia, Ph.D

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Research Experience

California Institute of Technology, Pasadena, California, March 2024-Present

Biological Engineering Department - Murray Lab – Senior Research Scientist

Senior research scientist working the Army's DEVCOM CBC lab and located at Caltech. Research work focuses on the use of large language models and data-driven techniques to enable high-throughput biological catalyst optimization and biomaterials production.

DEVCOM Chemical Biological Center, Edgewood, Maryland, Dec 2021-March 2024

Biochemistry Division - Lux Lab - National Research Council Postdoctoral Fellow

As part of the congressionally funded Cell-Free Biomanufacturing Institute, I was responsible for leading and being part of teams developing high-throughput testing platforms designed to improve scaled cell-free biosensing and cell-free metabolic engineering systems.

California Institute of Technology, Pasadena, California, March 2020-Dec 2021

Biological Engineering Department - Murray Lab - National Research Council Postdoctoral Fellow

Development and use of computational and experimental tools to produce biocircuitry for non-canonical cell-free systems.

Oak Ridge National Laboratory, Oak Ridge, Tennessee, June 2014 – March 2020

Biosciences Division - Doktycz Lab - National Science Foundation Graduate Research Fellow

Thesis work was focused on developing cell-free systems optimized for cell-free metabolic engineering and protein production as a tool for biological discovery and biological production.

Education

The University of Tennessee, Knoxville Knoxville, TN 2015-2020

Ph.D. in Energy Science and Engineering,
Thesis: Cell-Free Enabled Bioproduction and Biological Discovery
Advisor: Dr. Mitchel J. Doktycz

Ripon College Ripon, WI 2010-2014

B.A. Chemistry; Majors: Chemistry, History; Minors: Economics
Thesis: *Isolation and Expression of JT-5 Isolate Glycohydrolytic Enzymes*

Fellowships, Awards, and Grants

2024-Present	**Grant:** DoD Tri-Service Biotechnology for a Resilient Supply Chain (T-BRSC) (300K)
2023-Present:	**Grant:** Chemical Biological Advanced Materials and Manufacturing Science ($750K)
2022-Present:	**Grant:** Principal Investigator: DEVCOM CBC Laboratory Independent Research Program ($405K)
2021-2024:	**Fellowship:** National Research Council Postdoctoral Fellowship
2020:	**Award:** ORNL (Biosciences Division) Distinguished Achievement Award
2020:	**Award:** UT Extraordinary Professional Promise Award
2017-2020:	**Fellowship,** National Science Foundation Graduate Research Fellowship
2017:	**Award:** Forum on Science Ethics and Policy Writing Competition 1st Place
2016:	**Award**, GEM Consortium Conference 2016: 1st Place Poster Award
2016:	**Award**, 2016 National Science Foundation Conference Travel Grant
2015-16:	**Fellowship,** Energy Science & Engineering, Bredesen Center for Interdisciplinary Research and Graduate Education Fellowship, University of Tennessee
2015-16:	**Fellowship,** GEM Consortium Graduate Fellowship

Publications

Selected Publications

- Brown, D.M.; Phillips, D **Garcia, D.C.** et al.; Semi-automated Production of Cell-Free Biosensors. *In Submission*. (2024)
- **Garcia, D.C**.; Davies, J.P.; Phillips, D.; Miklos, A.; Lux, M.; High-Throughput Optimization of Paper-Based Cell-Free Biosensors. *In Submission*. (2024)
- **Garcia, D.C**.; Davies, J.P.; Lee, M.; Lux, M.; Cell-Free Optimized Production of Protoporphyrins. BiorXiv, https://doi.org/10.1101/2023.12.28.573540. (2023)
- McManus, J.B.; Bernhards, C.B.; Sharpes, C.E.; **Garcia, D.C**.; Cole, S.D.; Murray, R.M.; Emanuel, P.A.; Lux, M.W. Rapid Characterization of Genetic Parts with Cell-free Systems, *Journal of Visualized Experiments*, (2021)
- **Garcia, D.C.;** Dinglasan, Jaime L.N.; Shrestha, H.; Abraham, P.E.; Hettich, R.L.; Doktycz, M.J.; A lysate proteome engineering strategy for enhancing cell-free metabolite production. *Metabolic engineering communications.* (2020)
- **Garcia, D.C.**, Cheng, X., Land, M, Standaert, R., Morrell-Falvey, J., Doktycz, M. Computationally-Guided Discovery and Experimental Validation of Indole-3-Acetic Acid Synthesis Pathways. *ACS Chemical Biology.* (2019).
- Cecil, J. H.; **Garcia, D. C**.; Giannone, R. J.; Michener, J. K. Rapid, Parallel Identification of Catabolism Pathways of Lignin-Derived Aromatic Compounds in Novosphingobium Aromaticivorans. *Appl. Environ. Microbiol.* (2018)
- **Garcia, D.C**., Mohr, B., Dovgan, J. T., Hurst, G. B., Standaert, R. F., and Doktycz, M. J. Elucidating the potential of crude cell extracts for producing pyruvate from glucose. *Synthetic Biology.* (2018).
- Rydzak T.M., **Garcia, D.C.**, Stevenson, D., Armador-Noguez, D., Sladek, M., Klingeman, D.M., Holwerda, E., Brown, S.D. & Guss, A.M. Deletion of Type I glutamine synthetase deregulates nitrogen metabolism and increases ethanol production in Clostridium thermocellum. *Metab. Eng.* (2017)

Selected Conference Proceeding and Invited Talks:

- **Garcia, D.C**.; Davies, J.P.; Phillips, D.; Miklos, A.; Lux, M.; High-Throughput Optimization of Paper-Based Cell-Free Biosensors. *2nd Cell-Free Systems Conference*. (2023) (**Invited Talk**)
- **Garcia, D.C**.; Davies, J.P.; Lee, M.; Lux, M. Cell-Free Optimized Production of Protoporphyrins. *2023 DoD Biotechnology for Defense (B4D) Symposium*. (2023) (**Invited Talk**).
- **Garcia, D.C**.; Davies, J.P.; Phillips, D.; Miklos, A.; Lux, M.; High-Throughput Optimization of Paper-Based Cell-Free Biosensors. *Synthetic Biology Young Speaker Series*. (2023) (**Invited Talk**)
- **Garcia, D.C.,** Davies, J, Lux, M. High-Throughput Optimization of Cell-Free Systems. *Northwestern University Seminar*. (2023) (**Invited Talk**).
- **Garcia, D.C**., Davies, J, Lux, M. Cell-Free Prototyping and Rapid Optimization of Paper-Based Biological Sensors. American Chemical Society Meeting. (2022) (**Invited Talk**).
- **Garcia, D.C**., Dinglasan, E, Doktycz, M. A Systems and Synthetic Biology Approach to Engineering Cell-Free Metabolism. *Gordon Res. Conf.* (2019).
- **Garcia, D.C**., Cheng, X., Land, M., Doktycz, M. Elucidating Metabolic Networks through Computationally Predicted Cell-Free Metabolic Engineering. *PSNA Annual Conference.* (2019) (**Invited Talk**).
- **Garcia, D.C**., Cheng, X., Land, M., Doktycz, M. Elucidating Metabolic Networks through Computationally Predicted Cell-Free Metabolic Engineering. *Gordon Res. Conf.* (2017).
- **Garcia, D. C**., Doktycz, M. J. Cell-free synthesis of bacterial microcompartment proteins. *GEM Consortium Conf*. (2016).

Invention Disclosures and Patents:

- Doktycz, Mitchel J; Dinglasan, Jaime Lorenzo N; Garcia, David; Mohr, Ben P; "Cell-free metabolic pathway optimization through removal of select proteins 2021,"US Patent App. 17/235,450"
- Cecil, J. H.; Garcia, D. C.; Giannone, R. J.; Michener, J. K. Enzymatic Pathway for Conversion of a Model Lignin Linkage. UTRF Invention Disclosure *Number: 20014-03.* (2019).
- Cecil, J. H.; Garcia, D. C.; Giannone, R. J.; Michener, J. K. Identification of a Novel Guaiacol Demethylase for Lignin Valorization. UTRF Invention Disclosure *Number: 20013-03.* (2019).

Outreach, Education, and Mentoring

- **Engineering Biology Research Consortium Fellowships Mentor**: Participated in panels advising students applying to NSF GRFP and reviewed and edited application material (2024)
- **Caltech DIVE (Diversification Initiative through Veteran Education) Mentor:** Served as research mentor guiding student veterans through independent research projects. (2024)
- **Caltech SURF (Summer Undergraduate Research) Mentor:** Mentor for visiting undergraduate research students performing independent research in the Murray Lab.
- **Synthetic Biology Young Speaker Series Conference Organizing Committee:** Assisting with organizing and funding the first iteration of the Synthetic Biology Young Speaker Series conference. (2023-Present)
- **Synthetic Biology Gordon Research Seminar Elected Chair**: Responsible for funding and organizing Gordon research seminar. (2019-2023)
- **IGEM Graduate Student Advisor and Founder**: Responsible for assisting an undergraduate team of researchers design, perform, and present a novel work at the International Genetically Engineered Machine competition. (2015-2018)
- **IGEM Giant Jamboree Judge**: Judged student presentations and posters at IGEM conference (2017).
- **University of Tennessee Knoxville Undergraduate Mentor**: Mentored multiple students at various stages of their careers apply to graduate school, for fellowships, or undergraduate research positions. (2015-2020)
- **Daily Beacon Science Columnist**: Produced a science and society column dedicated to helping bridge the divide between science and the public through discussions of scientific events and topics. (2015-2017)