Kyle Crocker

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EDUCATION

Ohio State University, Columbus, OH — 2016 – 2021
PhD, Physics
Advisor: Ralf Bundschuh

University of Minnesota, Minneapolis, MN — 2012 – 2016
BS, Physics, *summa cum laude*

PROFESSIONAL EXPERIENCE

The University of Chicago, Chicago, IL — 2024 – present
Eric and Wendy Schmidt AI in Science Postdoctoral Fellow
Center for the Physics of Evolving Systems
Center for Living Systems
Department of Ecology & Evolution
Mentor: Seppe Kuehn

The University of Chicago, Chicago, IL — 2021 – 2024
Postdoctoral Scholar
Center for the Physics of Evolving Systems
Center for Living Systems
Department of Ecology & Evolution
Mentor: Seppe Kuehn

GRANTS, HONORS & AWARDS

Postdoctoral

Eric and Wendy Schmidt AI in Science Postdoctoral Fellowship — 2024 – present

NIH R01 Grant (1R01GM151538) — 2023 – present
"Environmental modulation of metabolic function in microbial communities."
Principal Investigator: Seppe Kuehn
Role: Provided preliminary data and co-authored the proposal.
Amount: $1,050,000

Graduate

Ohio State Graduate Student Fellowship — 2016 – 2017

Undergraduate

University of Minnesota Gold Scholar Award — 2012 – 2016

University of Minnesota Harry and Viola St. Cyr Research Scholarship — 2015 – 2016

University of Minnesota J. Morris Blair Scholarship in Physics — 2014 – 2015

PUBLICATIONS

11. **K. Crocker**†, A. Skwara†, R. Kannan, A. Murugan, S. Kuehn*. "Microbial functional guilds respond cohesively to rapidly fluctuating environments." *bioRxiv* (2025) bioRxiv:2025.01.30.635766

10. X. Chen, **K. Crocker**, S. Kuehn*, A. M. Walczak*, T. Mora*. "Inferring resource competition in microbial communities from time series." *bioRxiv* (2025) bioRxiv:2025.01.08.631910

9. K.K. Lee†, S. Liu†, **K. Crocker**, D.R. Huggins, M. Tikhonov, M. Mani*, S. Kuehn*. "Functional phases encode the response of the soil microbiome to environmental change." *bioRxiv* (2024) bioRXiv:2024.03.15.584851

8. **K. Crocker**, K.K. Lee, M. Chakraverti-Wuerthwein, Z. Li, M. Tikhonov, M. Mani, K. Gowda*, and S. Kuehn*. "Environmentally dependent interactions shape patterns in gene content across natural microbiomes." *Nature Microbiology*, **9**, 2022–2037 (2024). https://doi.org/10.1038/s41564-024-01752-4

7. M.A. Darcy, **K. Crocker**, Y. Wang, J.V. Le, G.M. Roozbahani, M.A.S. Abdelhamid, T.D. Craggs, C.E. Castro, R. Bundschuh, M.G. Poirier*. "High-Force application by a nanoscale DNA force spectrometer." *ACS Nano*, **16**, 5682-5695 (2022). doi.org/10.1021/acsnano.1c10698

6. Y. Wang†, J.V. Le†, **K. Crocker**, M.A. Darcy, P.D. Halley, D. Zhao, N. Andrioff, C. Croy, M.G. Poirier, R. Bundschuh, C.E. Castro*. "A nanoscale DNA force spectrometer capable of applying tension and compression on biomolecules." *Nucleic Acids Research* **49**, 8987-8999 (2021). doi.org/10.1093/nar/gkab656

5. **K. Crocker**, J. Johnson, C.E. Castro, R. Bundschuh*. "A quantitative model for a nanoscale switch accurately predicts thermal actuation behavior." *Nanoscale* **13**, 13746-13757 (2021). doi.org/10.1039/D1NR02873A

4. **K. Crocker**, J. London, A. Medina, R. Fishel, R. Bundschuh*. "Evolutionary advantage of a dissociative search mechanism in DNA mismatch repair." *Physical Review E* **103**, 052404 (2021). doi.org/10.1103/PhysRevE.103.052404

3. D. Zhao, J.V. Le, M.A. Darcy, **K. Crocker**, M.G. Poirier, C. Castro, R. Bundschuh*. "Quantitative modeling of nucleosome unwrapping from both ends." *Biophysical Journal* **117**, 2204-2216 (2019). doi.org/10.1016/j.bpj.2019.09.048

2. **K. Crocker**, V. Mandic*, T. Regimbau, K. Olive, T. Prestegard, E. Vangioni. "A systematic study of the stochastic gravitational-wave background due to core collapse." *Physical Review D* **95**, 063015 (2017). doi.org/10.1103/PhysRevD.95.063015

1. **K. Crocker**, V. Mandic*, T. Regimbau, K. Belczynski, W. Gladysz, K. Olive, T. Prestegard, and E. Vangioni. "Model of the stochastic gravitational-wave background due to core collapse to black holes." *Physical Review D* **92**, 063005 (2015). doi.org/10.1103/PhysRevD.92.063005

†co-first authors, *corresponding author.

SELECTED PRESENTATIONS

Invited

Workshop on Function of Evolving Systems, Simons Foundation, New York, NY (poster). December, 2024
"Environmentally dependent interactions shape patterns in gene content across natural microbiomes."

Systems Biology Seminar, Green Center for Systems Biology, UTSW Medical Center, Dallas, TX. January, 2024
"Searching for simplicity in microbial community interactions."

Contributed

Microbiome Meeting, Cold Spring Harbor Laboratory, New York, NY (poster). November, 2024
"Environmentally dependent interactions shape patterns in gene content across natural microbiomes."

National Institute for Theory and Mathematics in Biology,
Ecological Dynamics of Microbial Communities: New Approaches, Chicago, IL. April, 2024
"Dimension of microbial community response depends on environmental fluctuation rate."

University of Chicago TMC Microbiome Research Symposium, Chicago, IL. April, 2024
"Searching for simplicity in microbial community interactions."

American Physical Society March Meeting, Minneapolis, MN. March, 2024
"Timescale of environmental fluctuations determines dimensionality of microbial community response."

American Physical Society March Meeting, Las Vegas, NV. March, 2023
"Global patterns in gene content in soil microbiomes emerge from ecological interactions."

Gordon Research Conference on Stochastic Physics in Biology, Ventura, CA (poster). January, 2023
"Environmental lensing: global environmental patterns in gene content emerge from microbial interactions."

American Physical Society March Meeting, Chicago, IL. March, 2022
"Evolutionary advantage of a dissociative search mechanism in DNA mismatch repair."

American Physical Society March Meeting (virtual). March, 2020
"A quantitative model of temperature actuated DNA origami nanocaliper constructs."

Rustbelt RNA meeting, Cleveland, OH (poster). October, 2019
"A quantitative model of temperature actuated DNA origami nanocaliper constructs."

Ohio State Molecular Biophysics Training Program symposium, Columbus, OH (poster). May, 2019
"A quantitative model of temperature actuated DNA origami nanocaliper constructs."

Ohio State Molecular Biophysics Training Program symposium, Columbus, OH (poster). May, 2018
"Protein clamp mechanics in DNA mismatch repair."

TEACHING EXPERIENCE

- Teaching assistant, Quantitative Biology Summer Research Course: Microbial Interactions, Kavli Institute for Theoretical Physics 2021
- Grader, Physics 5501: Quantum Mechanics II, Ohio State University 2021
- Grader, Physics 6809: Topics in Biophysics, Ohio State University 2020
- Teaching assistant, Physics 1251: E&M, Waves, Optics, Modern Physics, Ohio State University 2018
- Teaching assistant, Physics 1250: Mechanics, Work and Energy, Thermal Physics, Ohio State University 2017

MENTORSHIP EXPERIENCE & TRAINING

Graham Sharp, graduate student in Biophysics, University of Chicago 2024
Measuring microbiome-driven carbon flux during soil rewetting (rotation).

University of Chicago Postdoc Mentor Training Certificate Course 2024

Rathi Kannan, graduate student in Molecular Engineering, University of Chicago 2023 – present
Measuring interaction structure in complex microbial communities.

Rudy Mendez Reina, graduate student in Biophysics, University of Chicago 2023 – 2024
Ecological learning in microbial communities.

Milena Chakraverti-Wuerthwein, graduate student in Biophysics, University of Chicago 2022
Quantifying pH-dependence of nitrite toxicity during bacterial denitrification (rotation).

OUTREACH EXPERIENCE & TRAINING

Co-organizer for UChicago South Side Science Fest demo 2024

University of Chicago Postdoc Diversity, Equity, & Inclusion Training Certificate Course 2023 - 2024

Club leader with Clubes de Ciencia Mexico 2023

ACADEMIC SERVICE

Refereed manuscript for *Nature Microbiology*