

# Corwin Kerr, PhD

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## EDUCATION

- University of Michigan**, Ann Arbor 2019 – May 2026 (conferral)  
Ph.D., Chemical Engineering GPA 3.9/4.0  
Thesis: “**Controlling Dislocations to Enable Crystalline Colloidal Robots**”  
National Defense Science and Engineering Graduate Fellowship
- North Carolina State University**, Raleigh May 2019  
B.S., Chemical Engineering Minor, Mathematics GPA 4.0/4.0

## PROJECTS

- Simulating crystal defects for actuation and logic** **Python**  
*Sharon Glotzer Lab, University of Michigan* Fall 2019 – Present
- Built Python-driven molecular dynamics workflows to systematically probe and control defects across large parameter ranges
  - Designed novel logic gates that use crystal dislocations as signals with >90% accuracy
  - Configured reproducible Slurm analysis pipelines to manage terabytes of simulation data
  - Supported proposal development (technical writing, project plans, resource justification)
- Low cost sensor for microfluidic flow reactor** **LabVIEW, MATLAB**  
*Milad Abolhasani Lab, NC State University* Sept 2017 – May 2019
- Developed sensor for velocity & slug length in two-phase microfluidic systems, enabling studies of reaction kinetics of quantum dot formation
  - Validated mean absolute error against tracked video at 1% for velocity, 3% for length
  - Generated dashboards to visualize algorithm prototypes in Wolfram Mathematica
  - Implemented algorithm in LabVIEW that integrates mass flow controllers, syringe pumps, liquid phase sensors and deployed PID control of velocity

## SOFTWARE ENGINEERING

- Maintainer**, signac framework: data and workflow management **Python**
- Developed efficient and fully tested algorithm to transform high dimensional data spaces into browsable networks and an intuitive user interface for it in response to internal needs
  - Pitched software and gave guided tutorials at international talks and poster sessions
  - Simplified the API, documentation, and tutorials by applying consistent metaphors
- Contributor, HOOMD-blue: particle simulation toolkit **C++, Python**
- Implemented new patchy potential for anisotropic particle interactions
  - Developed the model in collaboration with experimental application of active particles
- Wolfram Summer School, Waltham, MA, 2019 **Mathematica/Wolfram Language**
- Prototyped algorithm to read images of molecular diagrams (blog earned “Staff Pick”)

## LEADERSHIP

- Undergraduate research mentor**, Ann Arbor, MI Summer 2021–2023  
*Summer Undergraduate Research in Engineering Program, University of Michigan*
- Trained and mentored an undergraduate student in simulation and analysis for significant contribution to a publication
- Peer Mentor**, Ann Arbor, MI August 2021 – May 2022  
*Department of Chemical Engineering, University of Michigan*
- Facilitated discussion around and provided feedback on presentations and reports

- Presented audience-tailored technical demonstrations of crystal defects to public (K-retirees)

Process Control Graduate Student Instructor, Ann Arbor, MI Fall 2024

## PUBLICATIONS

3. (in prep) **C. B. Kerr**, N. K. Gunaratne, P. W. A. Schönhöfer, S. C. Glotzer, “Dislocations by Design: Designing swelling clusters to control dislocations and reshape crystallites”
2. **C. B. Kerr**, R. W. Epps, and M. Abolhasani, “A low-cost, non-invasive phase velocity and length meter and controller for multiphase lab-in-a-tube devices”. *Lab on a Chip*. <https://doi.org/10.1039/c9lc00296k>
1. K. Abdel-Latif, R. W. Epps, **C. B. Kerr**, C. M. Papa, F. N. Castellano, and M. Abolhasani, “Facile Room-Temperature Anion Exchange Reactions of Inorganic Perovskite Quantum Dots Enabled by a Modular Microfluidic Platform”. *Advanced Functional Materials*. <https://doi.org/10.1002/adfm.201900712>. **My contribution: key measurement module.**

## PRESENTATIONS & POSTERS

### Oral Presentations

6. “Interactive Signac Tutorial” with Brandon Butler. *Tutorials for FAIR and TRUE Simulations*. Mainz, Germany. September 28, 2023.
5. “signac: an adaptable data and workflow management framework” with Brandon Butler. *CECAM Flagship Workshop Proposal FAIR and TRUE Data Processing for Soft Matter Simulations*. Mainz, Germany. September 25, 2023.
4. “Towards a Colloidal Crystal Robot Gripper”. *American Physical Society March Meeting 2023*. Las Vegas, NV. March 10, 2023.
3. “Interactive Signac Tutorial”. *Foundations of Molecular Modeling Conference*. Delavan, WI. July 21, 2022.
2. “signac: Simple Data and Workflow Management.” *American Physical Society March Meeting*. Chicago, IL. March 14, 2022.
1. “A Low-Cost Velocity and Slug Length Meter for ‘Lab-on-a-Tube’ Devices for Real-Time Control.” *National Conference on Undergraduate Research*. Kennesaw State University, GA. April 12, 2019.

### Poster Presentations

6. “Towards a Colloidal Crystal Robot Gripper”. *American Chemical Society Colloids 2023*. Raleigh, NC. June 4, 2023.
5. “Controlling Defects Towards Colloidal Robotics”. *Amherst Soft Matter Summer School*, Amherst, MA. June 2022.
4. “Converting a Chemical Line Structure Diagram to its Graph Representation” *Wolfram Summer School*, Waltham, MA. July 2019.
3. “Flow Characterization for Multi-Phase Lab-in-a-Tube Devices via Low-Cost Optical Methods.” NC State University, Spring Undergraduate Research Symposium. April 2019. **(Outstanding Poster Presentation, 24 awardees in 200 posters)**
2. “A Low-Cost Optical Velocity Meter for Multi-Phase Lab-on-a-Tube Devices.” *American Institute of Chemical Engineering, Undergraduate Student Poster Competition*. Pittsburgh, PA. October 2018. **(1<sup>st</sup> Place in category “General Engineering”)**
1. “Optical Detection of Droplet Velocity in Two-Phase Microfluidic Systems.” *State of North Carolina Undergraduate Research & Creativity Symposium*. November 2018.