

Matthew L. Bowers

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Education

B.A. in Chemistry and Computer Science (Intelligent Systems), Columbia University, New York, NY May 2020
GPA: 4.12 (Computer Science: 4.29, Chemistry: 4.23), Junior Phi Beta Kappa, Dean's List (all semesters)

Skills

- C, C++, Java, Python (PyTorch, TensorFlow, NumPy, & SciPy), CUDA, R, Git, OCaml, Haskell, Bash, Vim.
- Computer Science Coursework: Machine Learning, Operating Systems, Compilers, Networks, Advanced C/C++, Algorithms, CS Theory, Computation & the Brain, Linear Algebra, Discrete Math, Calc. III & IV.
- Chemistry Coursework: General Chemistry & Lab, Organic Chemistry & Lab, Physical Chemistry & Lab, Electricity and Magnetism, Classical and Quantum Waves, Quantum Chemistry.

Experience

Massachusetts Institute of Technology, Learning Matter Group **New York, NY**
Research Assistant, Gomez-Bombarelli Group 2019-Present

- Develop graph convolutional neural architectures for faster and more accurate chemical simulation.
- Develop TupleParallel, an internal tool for massive parallelization of graph-based learning.
- Hired to continue work remotely during the academic year on graph-based machine learning.

Columbia University, Departments of Math and Chemistry **New York, NY**
Teaching Assistant, Discrete Mathematics, Calculus III, Chemistry Help Room 2018-Present

- Provide individual instruction in multivariable calculus, discrete math, organic and general chemistry.

Columbia University, Theoretical Chemistry Group **New York, NY**
Research Assistant and Programmer, Angelo Cacciuto Group 2017-Present

- Programmed GPU-accelerated chemical simulations in C and CUDA to understand self-assembly in active matter and design a novel method for improving self-assembly for smart and active materials.
- Authored a publication (*Active Sculpting of Colloidal Crystals*) published in *The Journal of Chemical Physics* in 2019. A second publication is soon to be submitted for review.

Columbia University, Materials Group and Spectroscopy Lab **New York, NY**
Research Assistant, Jonathan Owen & Andrew Crowther Groups Summer 2017

- Synthesized & spectroscopically analyzed novel CdSe/S quantum dot nanoplatelets for use in solar cells.

Projects

Parser for Custom Languages (2019)

- Designed a custom Parser capable of parsing all of Python as well as arbitrary custom languages described in a modified Backus-Naur form (BNF) that is both Turing complete and efficiently compilable.
- Wrote the grammar of the BNF in the BNF itself, allowing it to compile itself (bootstrap compilation).

Espresso Shell (2018-2019)

- Created a Python-Bash hybrid shell combining the adeptness of Bash for basic tasks with the flexibility and expressiveness of Python for more advanced operations. Used as full replacement for Bash for a year so far.

Coral: A Blazingly Fast, Gradually-Typed Python-like Language (2018)

- Worked in a team of 4 to write a compiler in OCaml for a language of our design, which combines the flexibility of Python with the speed of statically-typed compiled languages: <https://github.com/ja3067/Coral>

Debian Linux Scheduler & Filesystem (2018)

- Modified the Linux kernel at a low level to replace the default CFS process scheduler with a custom round-robin scheduler and a custom filesystem.

Awards & Publications

- Das, S., **Lee Bowers, M.**, Bakker, C., & Cacciuto, A. (2019). Active sculpting of colloidal crystals. *The Journal of Chemical Physics*, 150(13), 134505.
- Poster at the Columbia Undergraduate Research Symposium: *Predicting Scalar Coupling Constants Through Deep Learning*. Bowers, M., Wang, W., & Gomez-Bombarelli, R. (2019).
- **Junior Phi Beta Kappa** (2019), Columbia University – awarded to 2% of undergraduates.
- **Class of 1939 Fellowship** (2019), Columbia University
- **Columbia College Summer Funding Program Fellowship** (2019), Columbia University
- **Guthikonda Fellowship** (2018), Columbia University
- **Science Research Fellowship** (2016), Columbia University – multi-year research funding