

Kyle Fridberg

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Education

HARVARD UNIVERSITY

A.B. Candidate in Chemistry & Physics and Mathematics (GPA 3.77/4.00)

Expected May 2023

- Previous coursework: numerical methods, physical mathematics, partial differential equations, random matrix theory, differential geometry, vector calculus, linear algebra, probability, complex analysis, real analysis, abstract algebra, physics (quantum mechanics, classical mechanics, wave mechanics, electricity and magnetism), chemistry (organic and inorganic).

Research

HARVARD UNIVERSITY

Independent Math Research (September 2019–present)

- Discovered a spiral made of regular n -gons and proved a convergence result. Manuscript submitted to the Rocky Mountain Journal of Mathematics (2022): A regular n -gon spiral. **Fridberg, K.** <https://arxiv.org/abs/2211.06484>
- Delivered oral presentations of my work involving regular n -gon spirals and partitioning divergent Dirichlet series at Harvard's Math Table (an undergraduate math colloquium series).

Prof. Michael Brenner Group (May 2021–November 2021)

- Wrote a cellular automata model for mutualistic microbial communities in Python.
- Developed functionality to introduce mutants in the cellular automata and analyze the results.
- Publication: Global dynamics of microbial communities emerge from local interaction rules (2022). van Vliet S, Hauert C, **Fridberg K**, Ackermann M, Dal Co A. *PLOS Computational Biology* 18(3): e1009877. <https://doi.org/10.1371/journal.pcbi.1009877>

Prof. Mikhail Lukin Lab Group (March 2020–November 2020)

- Developed python program that efficiently optimizes microwave pulse generation for driving SiV spin qubits.
- Interfaced with lab devices to conduct remote optimization tests.

Prof. Theodore Betley Lab Group (February 2019–February 2020)

- Synthesized and characterized triiron clusters to examine reactivity with small-molecule substrates.

UNIVERSITY OF COLORADO BOULDER

Prof. Mark Ablowitz Group (June 2022–present)

- Ongoing project: derive and analytically solve a fractional generalization of the discrete Korteweg de Vries and Toda lattice equations.
- After obtaining the correct discrete evolution operator, I am working to prove completeness of the eigenfunctions to obtain a spectral (fractional) representation of the operator.

Prof. Michael Marshak Lab Group (June 2016–August 2018)

- Synthesized a novel mixed iron/manganese sulfate compound (Fe/Mn-rhombochalcocite).
- Delivered oral presentation at the August 2018 American Chemical Society national meeting.

POLYMATH REU (June 2021-August 2021)

- Working with Prof. Yunus Zeytuncu, I used Blaschke products to derive a novel, simple formula for the isogonal conjugate point in triangles (see result on projects page of website).

Skills

Technical: Mathematica, Python, MATLAB, LaTeX, GitHub, some familiarity with C++, Julia, Java, and POV-Ray.

Research: Algebraic manipulations, series manipulations and exact evaluation, asymptotics of sums and integrals, scientific computing, stochastic optimization, implementing stochastic cellular automata, implementing a particle-in-cell (PIC) plasma model, numerical integration and differentiation, numerical linear algebra, inorganic synthesis, retrosynthetic analysis.

Additional: Creative problem solving, pattern recognition, presenting results orally and in writing with good clarity of exposition.

Honors and Awards

- Regeneron Science Talent Search—6th Place (2018)
- Intel International Science and Engineering Fair—1st and Best in Chemistry Category (2017)
- Colorado Science and Engineering Fair—1st Place in Environmental Sciences (2016)
- USA Climbing Youth National Championships—placed top 30 (2013-2016)