

Garrett Ervin

Momentum MSCA Postdoctoral Fellow
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(2026 -)

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Previous Academic Appointments

- Harry Bateman Postdoctoral Scholar 2022 - 2025
Division of Physics, Mathematics and Astronomy, Caltech
- Special Faculty Lecturer, 2020 - 2022
Department of Mathematical Sciences, Carnegie Mellon University
- Postdoctoral Associate, 2017 - 2020
Department of Mathematical Sciences, Carnegie Mellon University

Education

- Ph.D. in Mathematics, 2017
University of California, Irvine
Advisor: Martin Zeman
- B.S. with Honor in Mathematics and English, 2009
California Institute of Technology

Research Interests

Set theory, theory of linear orders, graph theory, theory of submodular functions

Publications and Preprints

1. Garrett Ervin and Eric Paul, "Commutativity laws for ordinal algebras" (in preparation).
2. Garrett Ervin and Eric Paul, "The Additive Arithmetic of Linear Orders" (submitted).
3. Garrett Ervin, Alberto Marcone, and Thilo Weinert, "Untranscendable order types" (submitted).
4. Álvaro Diaz Ramos, Garrett Ervin, and Saharon Shelah, "Generalized sums of linear orders" (preprint).
5. Garrett Ervin, "Self-embeddings of linear orders" (preprint).
6. Garrett Ervin and Ethan Gu, "Left absorption in products of countable orders" *Order* (2024): 1-25.
7. Garrett Ervin, "Decomposing the real line into everywhere isomorphic suborders," *Proceedings of the American Mathematical Society* 152.03 (2024): 925-939.
8. Garrett Ervin, "Distinct orders dividing each other on both sides," *Proceedings of the American Mathematical Society* 147 (2019): 3729-3741.
9. Garrett Ervin, "Every linear order isomorphic to its cube is isomorphic to its square," *Advances in Mathematics* 313 (2017): 237-281.

Presentations

Invited Talks:

- *Commutativity laws for order types* October 2026
University of Vienna Logic Colloquium
- *Euclidean division and additive commutativity of linear orders* September 2026
McGill Descriptive Dynamics and Combinatorics Seminar
- *New arithmetic laws for order types* March 2026
Southern Illinois University Logic Seminar
- *New arithmetic laws for order types* January 2026
ASL Winter Meeting at the Joint Mathematics Meeting (plenary talk)
- *Additive commutativity for order types* December 2025
UCI Logic Seminar
- *Cancellation and absorption in lexicographic products* March 2025
Leeds Set Theory Seminar
- *Sums and automorphisms of linear orders* February 2025
UCLA Logic Colloquium
- *The arithmetic of linear orders* October 2024
ASL 2024 Fall Western Sectional Meeting
- *The arithmetic of linear orders* April 2024
UCI Logic Seminar
- *Infinitary submodular functions and maximum flows* March 2023
ASL 2023 North American Annual Meeting
- *Decomposing the real line into everywhere isomorphic suborders* November 2022
UCLA Logic Colloquium
- *Filter flows* May 2022
Caltech Logic Seminar
- *Paths and boundaries in locally finite graphs* June 2021
UCI Logic Seminar
- *Self-similar structures* June 2019
ASL 2019 North American Annual Meeting
- *Self-similar structures* January 2019
University of Illinois at Urbana-Champaign Logic Seminar
- *Sierpiński's cube problem* May 2018
ASL 2018 North American Annual Meeting
- *The cube problem for linear orders* March 2017
Rutgers Logic Seminar
- *Linear orders satisfying $L^n = L$* December 2013
Cornell Logic Seminar

Research Talks:

- *Tarski's commuting sum problem for linear orders* October 2026
ELTE Borel Combinatorics Seminar
- *New arithmetic laws for order types* March 2026
ELTE Borel Combinatorics Seminar
- *A dichotomy theorem for order types of orbit equivalence relations on $\mathbb{R}$* March 2025
Caltech Logic Seminar
- *The arithmetic of linear orders* June 2024
Caltech Logic Seminar
- *Filter flows* April 2022
CMU Logic Seminar
- *Maximally splitting pruned trees in locally finite graphs* October 2020
CMU Logic Seminar
- *Distinct orders that divide one another on both sides* February 2020
CMU Logic Seminar
- *Isoperimetry and matchings in Cayley graphs* April 2019
CMU Logic Seminar
- *Decomposing the real line into everywhere isomorphic pieces* April 2018
CMU Logic Seminar
- *Sierpiński's cube problem for linear orders* September 2017
CMU Logic Seminar
- *Every linear order isomorphic to its cube is isomorphic to its square* May 2016
Logic in Southern California Meeting, UCLA
- *Sierpiński's cube problem: a complete solution* March 2016
UCI Logic Seminar
- *Linear orders isomorphic to one of their finite powers* March 2015
Logic in Southern California Meeting, Caltech

Expository Talks:

- *Set theory via order theory* October 2022
Ma 20 "Frontiers in Math" (Caltech Undergraduate Seminar)
- *Four theorems of Cantor* June 2022
CMU Summer Undergraduate Research Seminar
- *Splitting the real line in two (order-theoretically)* February 2022
CMU Graduate Student and Postdoc Seminar

Mentoring

Undergraduate research:

- Undergraduate Research in Mathematics (UC Berkeley): 2026 - present
With Atticus Cull on dichotomy theorems for minimal condensation schemes for linear orders.
- Undergraduate Research in Mathematics (Caltech / UC Berkeley): 2025 - 2026
With Mohammedsaid Alhalimi on ordered full groups of orientation-preserving homeomorphisms of $\mathbb{R}$.

- Undergraduate Research in Mathematics (Stanford): 2024 - present
With Álvaro Díaz Ramos on associative sums of linear orders and groups (joint with Saharon Shelah).
- Summer Undergraduate Research Fellowship (SURF) (Caltech): 2024 - present
With Eric Paul on linear orders and ordered groups papers (cf. “The additive arithmetic of linear orders,” “Commutativity laws for ordinal algebras”).
- Summer Research in Mathematics (Caltech): Summer 2023
With Eric Paul on multiplicative cancellation of linear orders (cf. forthcoming “Absorption and cancellation in products of linear orders”).
- Summer Research in Mathematics (CMU): Summer 2022
With Ethan Gu on absorption in products of order types (cf. “Left absorption in products of countable orders” published in *Order*).

Graduate research:

- Graduate research in symbolic dynamics (Caltech): 2023 - present
With Kimberly Golubeva on automorphism groups of minimal subshifts of symbolic dynamical systems (joint with Joshua Frisch).

Undergraduate reading:

- Reading in Model Theory (Caltech): 2023 - 2024
With Joey Litvin: *Model Theory: An Introduction* by David Marker.
- Reading on Linear Orders (CMU): 2022
With Ethan Gu: *Linear Orderings* by Joseph Rosenstein.
- Reading in Model Theory (CMU): 2019
With Katalin Berlow *Model Theory: An Introduction* by David Marker.

Advancement committees:

- Kimberly Golubeva (Caltech): advancement to candidacy Spring 2024
- Michael Wolman (Caltech): advancement to candidacy Spring 2023

Teaching

ELTE: 2026 - present

- Arithmetic of linear orders and one-dimensional dynamics

Caltech: 2022 - 2025

- Computability Theory I, II, III (x2)
- Set Theory I, II
- Model Theory
- Linear Orders

Carnegie Mellon:

2017 - 2022

- Concepts of Mathematics (x7)
- Linear Algebra for Data Science
- Eureka! Discovery and Its Impact
- Integration and Approximation (x2)
- Mathematical Logic
- Calculus in Three Dimensions
- Matrix Algebra

UCI:

- As instructor: Differential Calculus (x3)
- As TA: Combinatorics, Linear Algebra, Multivariable Calculus I (x2), Multivariable Calculus II, Probability and Statistics, Integral Calculus (x2)

Outreach

Helped organize and lead the Math Circle at UC Irvine for gifted high school and middle school students.

Math Circles led:

- “Summing Ordinals”
- “Random walks and even more peregrinations”
- “Infinite sums, self-reference, and related peregrinations”
- “Minimum number of experiments”
- “Insane tic-tac-toe”
- “Some problems and questions in probability”

Diversity, Equity, Inclusion

Participated in the course *SEC 201: Advancing Inclusion in College Teaching* in the Winter 2023 quarter at Caltech.

- Writing an inclusive syllabus, getting feedback from students, inclusivity and active learning, group work, deficit versus asset thinking, alternative grading schemes.
- I led a class day on stereotype threat and how to combat it with a values affirmation exercise.

Citizenship

American, Canadian