

Garrett Ervin

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Previous Academic Appointments

- 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
- M.S. in Mathematics, 2016
University of California, Irvine
- 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, "The additive arithmetic of linear orders" (preprint),
2. Garrett Ervin, "Self-embeddings of linear orders" (preprint),
3. Garrett Ervin and Ethan Gu, "Left absorption in products of countable orders" *Order* (2024): 1-25.
4. Garrett Ervin, "Decomposing the real line into everywhere isomorphic suborders," *Proceedings of the American Mathematical Society* 152.03 (2024): 925-939.
5. Garrett Ervin, "Distinct orders dividing each other on both sides," *Proceedings of the American Mathematical Society* 147 (2019): 3729-3741.
6. Garrett Ervin, "Every linear order isomorphic to its cube is isomorphic to its square," *Advances in Mathematics* 313 (2017): 237-281.

Presentations

Invited Talks:

- *New arithmetic identities for order types* January 2026
ASL Winter Meeting at the Joint Mathematics Meeting (plenary talk)
- *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:

- *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*
Ma 20 “Frontiers in Math” (Caltech Undergraduate Seminar) October 2022
- *Four theorems of Cantor*
CMU Summer Undergraduate Research Seminar June 2022
- *Splitting the real line in two (order-theoretically)*
CMU Graduate Student and Postdoc Seminar February 2022
- *Iterations of proper forcing*
UCI Logic Seminar March 2015
- *Todorćević’s proof of Baumgartner’s Axiom*
UCI Logic Seminar October 2014
- *The isomorphism problem for κ -dense sets of reals*
UCI Logic Seminar May 2014
- *Basic applications of Martin’s Maximum*
UCI Logic Seminar October 2013
- *Basic applications of the Proper Forcing Axiom*
UCI Logic Seminar March 2013
- *The Shoenfield absoluteness theorem*
UCI Logic Seminar November 2011

Mentoring

Undergraduate research:

- Summer Undergraduate Research Fellowship (SURF) (Caltech): Summer 2024
Conducted joint research on linear orders and ordered groups with Caltech undergraduate Eric Paul, resulting in a forthcoming paper (“The additive arithmetic of linear orders”)
- Summer Research in Mathematics (Caltech): Summer 2023
Conducted joint research on linear orders with Caltech undergraduate Eric Paul, resulting in a forthcoming paper (“Absorption and cancellation in products of linear orders”)
- Summer Research in Mathematics (CMU): Summer 2022
Conducted joint research on linear orders with CMU undergraduate Ethan Gu, resulting in a submitted paper (“Left absorption in products of countable orders”)

Graduate research:

- Graduate research in symbolic dynamics (Caltech): 2023 - 2024
Collaborated with Caltech graduate student Kimberly Golubeva on research on automorphism groups of minimal subshifts of symbolic dynamical systems

Undergraduate reading:

- Reading in Model Theory: Winter 2023
Supervised reading of *Model Theory: An Introduction* by David Marker, Chapters 4-7, with Caltech undergraduate Joseph Litvin Spring 2024

- Reading on Linear Orders: Spring 2022
Supervised reading of *Linear Orderings* by Joseph Rosenstein, with CMU undergraduate Ethan Gu; led to a summer research project
- Reading in Model Theory: Spring 2019
Supervised reading of *Model Theory: An Introduction* by David Marker, Chapters 1-4, with CMU undergraduate Katalin Berlow; led to an original exposition of Scott's Isomorphism Theorem

Advancement committees:

- Sat on the committee for Caltech graduate student Kimberly Golubeva's advancement to candidacy examination Spring 2024
- Sat on the committee for Caltech graduate student Michael Wolman's advancement to candidacy examination Spring 2023

Teaching

Caltech:

- Computability Theory I, II Winter 2025
Fall 2024
- Set Theory I, II Spring 2024
Winter 2024
- Model Theory Fall 2023
- Computability Theory II, III Spring 2023
Winter 2023
- Linear Orders Fall 2022

Carnegie Mellon:

- Concepts of Mathematics Spring 2022
Fall 2021
Spring 2021
Summer 2020
Spring 2020
Spring 2019
Summer 2018
- Linear Algebra for Data Science Fall 2021
- Eureka! Discovery and Its Impact Fall 2021
- Integration and Approximation Fall 2020
Fall 2019
- Logic Fall 2018
- Calculus in Three Dimensions Spring 2018
- Matrix Algebra Fall 2017

UCI:

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

Refereeing

- Referee for various journals and publishers, including *Israel Journal of Mathematics*, *Order*, *AMS Books*, and *Mathematical Logic Quarterly*

Outreach

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

Math Circles led:

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| • “Summing Ordinals” | Winter 2016 |
| • “Random walks and even more peregrinations” | Winter 2015 |
| • “Infinite sums, self-reference, and related peregrinations” | Fall 2014 |
| • “Minimum number of experiments” | Fall 2014 |
| • “Insane tic-tac-toe” | Spring 2014 |
| • “Some problems and questions in probability” | Fall 2013 |

Diversity, Equity, Inclusion

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

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

Citizenship

American, Canadian