Garrett Ervin

Momentum MSCA Postdoctoral Fellow   (*beginning March 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, Alberto Marcone, and Thilo Weinert, "Untranscendable order types" (preprint),

2. Álvaro Diaz Ramos, Garrett Ervin, and Saharon Shelah, "Generalized sums of linear orders" (preprint),

3. Garrett Ervin and Eric Paul, "The additive arithmetic of linear orders" (preprint),

4. Garrett Ervin, "Self-embeddings of linear orders" (preprint),

5. Garrett Ervin and Ethan Gu, "Left absorption in products of countable orders" *Order* (2024): 1-25.

6. Garrett Ervin, "Decomposing the real line into everywhere isomorphic suborders," *Proceedings of the American Mathematical Society* 152.03 (2024): 925-939.

7. Garrett Ervin, "Distinct orders dividing each other on both sides," *Proceedings of the American Mathematical Society* 147 (2019): 3729-3741.

8. 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 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

- *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:

- *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

- *Iterations of proper forcing*   March 2015
  UCI Logic Seminar

- *Todorcevic's proof of Baumgartner's Axiom*   October 2014
  UCI Logic Seminar

- *The isomorphism problem for κ-dense sets of reals*   May 2014
  UCI Logic Seminar

- *Basic applications of Martin's Maximum*   October 2013
  UCI Logic Seminar

- *Basic applications of the Proper Forcing Axiom*   March 2013
  UCI Logic Seminar

- *The Shoenfield absoluteness theorem*   November 2011
  UCI Logic Seminar

Mentoring

Undergraduate research:

- Undergraduate Research in Mathematics (Caltech / UC Berkeley):   January 2025 - present
  Ongoing research project with Mohammedsaid Alhalimi, recent
  undergraduate in math at Caltech and current Berkeley graduate
  student in math, on ordered full groups of orientation preserving
  homeomorphisms of $\mathbb{R}$.

- Undergraduate Research in Mathematics (Stanford):   Summer 2024 - present
  Ongoing research project with Álvaro Diaz Ramos, current
  senior in mathematics at Stanford, on associative sums of
  linear orders and groups (also joint with Saharon Shelah).

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

- <u>As instructor</u>: Differential Calculus (x3)
- <u>As TA</u>: 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:

• "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