Luna Elliott

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Heilbronn Fellow in Mathematics, University of Manchester

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Some publications appear under the name Luke Elliott.

Research profile

I study topology, dynamics and their connections with with geometric group theory and semigroup theory. In dynamics, my work connects to Thompson groups, Thompson monoids, the GNS rational group and unindexed subshifts of finite type. In particular I use finite state transducers to describe (the automorphism groups of) Thompson groups, and I have implemented algorithms in GAP for working with rational groups, automorphisms of shifts, and Thompson groups.

I also study more general group actions on the Cantor set and other highly disconnected spaces. With Collin Bleak and James Hyde, I established sufficient conditions for a group of homeomorphisms of the Cantor set to be generated by two elements (*Journal of the Institute of Mathematics of Jussieu*). With James Belk and Francesco Matucci, I gave a short proof of Rubin's theorem, which recovers topological actions from the abstract group under suitable hypotheses (*Israel Journal of Mathematics*). More recently, with Gemma Crowe, I have used the dynamics of Thompson's group V to solve the simultanious conjugacy problem.

In topological algebra, I study automatic continuity, uniqueness of Polish topologies, and Zariski topologies on endomorphism monoids and homeomorphism groups. My work on Polish topologies of endomorphism monoids appeared in *Advances in Mathematics*.

Academic Positions

Heilbronn Fellow in Mathematics, University of Manchester 2024–present

Competitively awarded three-year fellowship based on an independent research proposal. I divide my time equally between classified mathematical research for the Heilbronn Institute for Mathematical Research (HIMR) and my own research.

Visiting Assistant Professor, Binghamton University (SUNY) 2022–2024

Department of Mathematics and Statistics. Lectured in undergraduate mathematics and coordinated Math in Action.

Research Fellow, University of St Andrews 2022

Implemented GAP algorithms for GNS rational groups, automorphisms of shifts and Thompson groups.

Education

PhD in Mathematics, University of St Andrews 2021

Thesis, *On Constructing Topology from Algebra*.

MMath (Hons) in Mathematics, University of St Andrews 2018

Dissertation, *Infinite Symmetric Groups*.

Teaching

Binghamton University, 2022–2024

I taught six undergraduate classes across three courses, delivering over 300 lecture hours. My work included preparing and delivering lectures, holding office hours, designing assessments, and writing and marking examinations, quizzes and coursework.

- **2023–2024.** Lecturer for MATH 304 Linear Algebra and MATH 330 Number Systems (once each, nine contact hours per week combined). Course coordinator and lecturer for MATH 130 Math in Action (three contact hours per week).
- **2022–2023.** Lecturer for MATH 304 Linear Algebra (two classes in autumn, nine contact hours per week, and one in spring, four and a half contact hours per week).

University of St Andrews, 2018–2022

I led undergraduate tutorials in linear mathematics, analysis and abstract algebra.

- **MT2501 Linear Mathematics.** 2018–2019, 2019–2020 and 2021–2022.
- **MT2502 Analysis.** 2019–2020 and 2020–2021.
- **MT2505 Abstract Algebra.** 2018–2019 and 2019–2020.

Publications and preprints

The list contains 21 research articles, including 11 published in journals and an additional accepted article.

Published journal articles

1. L. Elliott. The Zariski topology on homeomorphism groups. *Topology and its Applications* (2026).
2. L. Elliott and A. Levine. The Diophantine problem in Thompson's group F. *Mathematics of Computation* (2026).
3. S. Bardyla, L. Elliott, J. D. Mitchell and Y. Péresse. Classifying the Polish semigroup topologies on the symmetric inverse monoid. *Proceedings of the Edinburgh Mathematical Society* (2026).
4. L. Elliott, A. Levine and J. D. Mitchell. E-disjunctive inverse semigroups. *Journal of Algebra* (2026).
5. J. Belk, L. Elliott and F. Matucci. A short proof of Rubin's theorem. *Israel Journal of Mathematics* (2025).
6. C. Bleak, L. Elliott and J. Hyde. Sufficient conditions for a group of homeomorphisms of the Cantor set to be two-generated. *Journal of the Institute of Mathematics of Jussieu* (2024).
7. S. Bardyla, L. Elliott, J. D. Mitchell and Y. Péresse. Topological embeddings into transformation monoids. *Forum Mathematicum* (2024).
8. L. Elliott, J. Jonušas, Z. Mesyan, J. D. Mitchell, M. Morayne and Y. Péresse. Automatic continuity, unique Polish topologies, and Zariski topologies on monoids and clones. *Transactions of the American Mathematical Society* (2023).
9. L. Elliott, J. Jonušas, J. D. Mitchell, Y. Péresse and M. Pinsker. Polish topologies on endomorphism monoids of relational structures. *Advances in Mathematics* (2023).
10. L. Elliott, A. Levine and J. D. Mitchell. Counting monogenic monoids and inverse monoids. *Communications in Algebra* (2023).
11. L. Elliott. A description of $\mathrm{Aut}(dV_n)$ and $\mathrm{Out}(dV_n)$ using transducers. *Groups, Geometry, and Dynamics* (2023).

Accepted journal article

12. B. de Witt and L. Elliott. Finite presentability of Brin–Higman–Thompson monoids via free Jónsson–Tarski algebras. Accepted in *Semigroup Forum*.

Arxiv articles

13. R. Cirpons, L. Elliott, A. Levine and J. D. Mitchell. Finite presentations for Thompson monoids. 2026.
14. S. Bardyla, L. Elliott and Y. Péresse. Maximal subgroups of homeomorphism groups. 2026.
15. S. Bardyla and L. Elliott. Polish topologies on endomorphism monoids of linear orders. 2026.
16. L. Elliott and A. Levine. Commutative decomposition of infinite symmetric groups and transformation monoids. 2026.
17. L. Elliott, A. Evetts and A. Levine. Counting automorphic orbits in finitely generated groups. 2026.
18. S. Bardyla, L. Elliott, J. D. Mitchell and Y. Péresse. A note on intrinsic topologies of groups. 2025.
19. R. Al Kohli, C. Bleak and L. Elliott. On epi$\mathcal{C}$ groups over language class $\mathcal{C}$. 2025.
20. L. Elliott, A. Levine and J. D. Mitchell. Computing congruences of finite inverse semigroups. 2024.
21. L. Elliott. Unindexed subshifts of finite type and their connection to automorphisms of Thompson's groups. 2021.

Research talks

I have given 28 research talks at conferences and seminars in various countries.

1. *Simultaneous Conjugacy in V.* Landing in Topology IV, Pisa, 2026 **Invited**.
2. *Thompson Monoids and Jónsson–Tarski Algebras.* Semigroup Seminar, Manchester, 2026.
3. *Reconstructing Topologies on Monoids.* ATTI, University of Udine (online), 2026. **Invited**.
4. *Thompson Partition Monoids and Jónsson–Tarski Algebras.* Theoretical and Computational Algebra, Guimarães, 2026. **Invited**.
5. *Automorphic Growth.* Semigroup Seminar, Manchester, 2026.
6. *Thompson Monoids.* RIMS conference, Kyoto, 2026. **Invited**.
7. *Topologizing Endomorphism Monoids.* AAA, Vienna, 2026 **Invited**.
8. *Thompson Monoids.* NBSAN, Durham, 2025 **Invited**.
9. *The Rational Group and Automorphisms of Thompson's Group V.* Semigroup Seminar, Manchester, 2025.
10. *Epic Groups.* HIMR Seminar, Manchester, 2025.
11. *Finding Topologies for Semigroups.* Semigroups, Automata and Languages Seminar, Porto (online), 2024 **Invited**.
12. *Finding Topologies for Semigroups.* Semigroup Seminar, Manchester, 2024.
13. *E-disjunctive Inverse Semigroups.* NBSAN, Manchester, 2024 **Invited**.
14. *Semigroup Theory.* Algebra Seminar, Binghamton, 2024.
15. *Finite Presentability of Thompson Monoids.* Algebra Seminar, Manchester, 2023 **Invited**.
16. *A Connection Between Thompson Groups and Subshifts of Finite Type.* Algebra Seminar, Binghamton, 2022.
17. *Unindexed Subshifts of Finite Type.* Analysis Seminar, Glasgow, 2022 **Invited**.
18. *Removing Indexing from Shift Spaces.* Pure Postgraduate Seminar, St Andrews, 2021.
19. *Removing Indexing from Shift Spaces.* Algebra and Combinatorics Seminar, St Andrews, 2021.
20. *Automorphisms of the Brin–Thompson Groups nV.* Young Geometric Group Theory X, Newcastle, 2021.
21. *Finding Topologies for Semigroups.* Pure Postgraduate Seminar, St Andrews, 2021.
22. *Automorphisms of the Brin–Thompson Groups nV.* London Mathematical Society Virtual Graduate Student Meeting, 2020.
23. *Rubin's Theorem.* St Andrews Research Day, 2020.
24. *Topological Semigroups.* St Andrews Burn Trip, 2020.
25. *Automorphisms of nV.* Pure Postgraduate Seminar, St Andrews, 2019.
26. *Vigorous Homeomorphism Groups.* St Andrews Burn Trip, 2019.
27. *Polish Semigroups.* EMS Postgraduate Meeting for Students, 2019.
28. *Polish Semigroups.* Algebra and Combinatorics Seminar, St Andrews, 2018.

Research funding and awards

Heilbronn Research Fellowship 2024

Three-year fellowship, valued at approximately £200,000.

Heilbronn Institute research grants. Three awards, one as principal applicant and two as co-applicant.

- *E-disjunctive inverse semigroups* (up to £3,000).
- *Use of practical algorithms to study inverse semigroups in GAP* (up to £5,000).
- *Algorithms for automatic semigroups* (up to £3,531).

Laidlaw Undergraduate Research and Leadership Programme 2017

£4,000 for a project on algorithms for commutative semigroups.

Academic service

- Co-organiser of the weekly Manchester Semigroup Seminar. I invite speakers and arrange accommodation for visiting speakers.
- Co-organiser of the European Mathematical Society's semigroup network (EMS TAG).
- Referee for peer-reviewed mathematics journals.

References available on request.