George Kenison

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Research Experience

Research Interests: Linear and Algebraic Dynamical Systems, Theory of Computation, Symbolic and Algebraic Computation, Program Analysis, Automated Verification.

Research Fellow in Computer Science and Informatics.,   September 2023–August 2025
School of Computer Science and Mathematics, Liverpool John Moores University.

Postdoctoral Researcher in Automated Reasoning and Program Analysis.,   April 2021–August 2023
Institute of Logic and Computation, Technische Universität Wien.

Postdoctoral Researcher in Infinite-State Systems and Dynamical Systems.,   June 2018–March 2021
Department of Computer Science, University of Oxford.

Education

PhD in Mathematics, *University of Warwick.*   2013–2017
Thesis: Asymptotics in conjugacy classes for free groups. EPSRC doctoral award studentship.

MMath (Masters of Mathematics), *University of Warwick, First Class Hons.*   2009–2013
Dissertation: Periodic orbits of hyperbolic and quasi-hyperbolic toral automorphisms

Peer-Reviewed Conference Papers

• **2024**. **The Threshold Problem for Hypergeometric Sequences with Quadratic Parameters**. In: *51st International Colloquium on Automata, Languages, and Programming (ICALP 2024)*. Vol. 297, 145:1–145:20.

• **2024** (**with** S. Hitarth, L. Kovács, and A. Varonka). **Linear Loop Synthesis for Quadratic Invariants**. In: *41st International Symposium on Theoretical Aspects of Computer Science, STACS 2024*. Vol. 289, 41:1–41:18.

• **2023** (**with** L. Kovács and A. Varonka). **From Polynomial Invariants to Linear Loops**. In: *Proceedings of the 2023 International Symposium on Symbolic and Algebraic Computation, ISSAC 2023*, pp. 398–406.

• **2023** (**with** K. Nosan, M. Shirmohammadi, and J. Worrell). **The Membership Problem for Hypergeometric Sequences with Quadratic Parameters**. In: *Proceedings of the 2023 International Symposium on Symbolic and Algebraic Computation, ISSAC 2023*, pp. 407–416.

• **2023** (**with** J. Nieuwveld, J. Ouaknine, and J. Worrell). **Positivity Problems for Reversible Linear Recurrence Sequences**. In: *50th International Colloquium on Automata, Languages, and Programming, ICALP 2023*, 130:1–130:17.

• **2022**. **On the Skolem Problem for Reversible Sequences**. In: *International Symposium on Mathematical Foundations of Computer Science, MFCS 2022*, 61:1–61:15.

• **2022** (**with** D. Amrollahi, E. Bartocci, L. Kovács, M. Moosbrugger, and M. Stanković). **Solving Invariant Generation for Unsolvable Loops**. In: *Static Analysis: 29th International Symposium, SAS 2022*. Radhia Cousot Award winning paper, pp. 19–43.

• **2021** (**with** O. Klurman, E. Lefaucheux, F. Luca, P. Moree, J. Ouaknine, M. A. Whiteland, and J. Worrell). **On Positivity and Minimality for Second-Order Holonomic Sequences**. In: *International Symposium on Mathematical Foundations of Computer Science, MFCS 2021*, 67:1–67:15.

• **2020** (**with** R. Lipton, J. Ouaknine, and J. Worrell). **On the Skolem Problem and Prime Powers**. In: *Proceedings of the 45th International Symposium on Symbolic and Algebraic Computation, ISSAC 2020*, pp. 289–296.

Peer-Reviewed Journal Articles

• **2025** (**with** R. Ait El Manssour, M. Shirmohammadi, and A. Varonka). **Simple Linear Loops: Algebraic Invariants and Applications**. In: *Proc. ACM Program. Lang.* 9.POPL, pp. 745–771.

• **2024** (**with** D. Amrollahi, E. Bartocci, L. Kovács, M. Moosbrugger, and M. Stanković). **(Un)Solvable loop analysis**. In: *Formal Methods in System Design* SAS 2022.

• **2019** (**with** R. Sharp). **Statistics in conjugacy classes in free groups**. In: *Geometriae Dedicata* 198.1, pp. 57–70.

• **2017** (**with** R. Sharp). **Orbit counting in conjugacy classes for free groups acting on trees**. In: *Journal of Topology and Analysis* 9.4, pp. 631–647.

Preprints

• (**with** J. Konieczny, F. Luca, A. Scoones, M. Shirmohammadi, and J. Worrell). **On the growth of hypergeometric sequences**. arXiv: `2507.22437 [math.NT]`.

• (**with** R. Ait El Manssour, M. Shirmohammadi, and J. Worrell). **Determination Problems for Orbit Closures and Matrix Groups**. arXiv: `2407.04626 [cs.CC]`.

• (**with** O. Klurman, E. Lefaucheux, F. Luca, P. Moree, J. Ouaknine, M. A. Whiteland, and J. Worrell). **On Inequality Decision Problems for Low-Order Holonomic Sequences**. arXiv: `2007.12282 [math.NT]`.

Technical Skills
Languages: Python, PARI/GP.
Tools: Matlab, Mathematica
Other: LaTeX, Git, SVN.

Teaching Experience
Co-lecturer for MSc course on *Formal Methods*,   **Summer 2022, Summer 2023**
Institute of Logic and Computation, Technische Universität Wien.

Co-lecturer for MSc course *Probabilistic Model Checking*,   **Winter 2019/20**
Department of Computer Science, University of Oxford.

Stipendiary Lecturer in Pure Mathematics, *St Peter's College, Oxford.*   **October 2018–September 2020**
- **Academic tutor** for second year undergraduates. Tutorials in *Linear Algebra*, *Integration*, *Group Theory*, and *Graph Theory*. Duties included feedback, assessment, and writing progression reports.
- **Admissions interviewer** for mathematics and joint schools.

Teaching Associate, *School of Mathematics, University of Bristol.*   **August 2017–May 2018**
- **Academic tutor** for *Linear Algebra*, *Calculus*, *Metric Spaces*, and *Geometry*.

Teaching Assistant, *Mathematics Institute, University of Warwick.*   **October 2013–June 2017**
- **Undergraduate supervisor**. Small group teaching across the first year mathematics curriculum.
- **Support classes** in *Analysis, Metric Spaces, Experimental Maths, Mathematical Computing*, and *Dynamical Systems*.

Departmental Award for Outstanding Teaching, *Mathematics Institute, University of Warwick.*

Student Feedback.
- "Always prepared, always cheerful and always willing to go that extra mile in helping students to understand—a true inspiration!"
- "He was engaging, whilst provoking the students to find their own way to the answers."
- "I was involved in an incident in term one and if it wasn't for his support, both [academic and pastoral], I wouldn't have made it through the term and hence the year."
- "George made me feel comfortable asking questions and. . . his analysis classes were a highlight of my week."

Selected Seminar Talks
Decision Problems for P-finite Sequences, *Warsaw.*   **July 2025**

The Threshold Problem for Hypergeometric Sequences with Quadratic Parameters, *Liverpool.*   **June 2024**

From Polynomial Invariants to Linear Loops, *IRIF, Paris.*   **Dec 2023**

(Un)Solvable Loop Analysis, *Liverpool.*   **Oct 2023**

Decision Problems for Hypergeometric Sequences, *TU Wien and ISTA.*   **Feb 2023**

On the Skolem Problem and Reversible Sequences, *Chalmers and Gothenburg.*   **July 2022**

On the Skolem Problem and Reversible Sequences, *TU Wien and ISTA.*   **May 2022**

On Positivity and Minimality for Second-Order Holonomic Sequences, *Open University.*   **Sept 2021**

On Positivity and Minimality for Second-Order Holonomic Sequences, *TU Wien and ISTA.*   **Sept 2021**

Skolem's Problem and prime powers, *Bristol.*   **Dec 2018**

Selected Conference and Workshop Talks
The Membership Problem for Hypergeometric Sequences, *Warsaw*,   **Jun 2025**
Workshop on Series, Automata, Matrices, Symbolic dynamics, and their Applications.

The Threshold Problem for Hypergeometric Sequences with Quadratic Parameters, *Vienna*,   **Sept 2024**
International Conference on Reachability Problems.

The Threshold Problem for Hypergeometric Sequences with Quadratic Parameters, *Tallinn*,   **July 2024**
International Colloquium on Automata, Languages, and Programming.

The Membership Problem for Hypergeometric Sequences with Quadratic Parameters, *Tromsø*,   **July 2023**
International Symposium on Symbolic and Algebraic Computation.

On the Skolem Problem for Reversible Sequences, *Kaiserslautern*,   **Oct 2022**
International Conference on Reachability Problems.

On the Skolem Problem for Reversible Sequences, *Vienna*,   **Aug 2022**
International Symposium on the Mathematical Foundations of Computer Science.

On Positivity and Minimality for Second-Order Holonomic Sequences, *Tallinn*,   **Aug 2021**
International Symposium on the Mathematical Foundations of Computer Science.

On the Skolem Problem and Prime Powers, *Kalamata*,   **July 2020**
International Symposium on Symbolic and Algebraic Computation.

Widening Participation and Outreach

Mathematics in Education and Industry, *Problem Solving Matters*: *tutor and mentor*. **Summer 2017**

Further Maths Support Programme, *STEP/AEA workshops, enrichment days, Royal Institution master-* **2012–2019**
classes, and problem solving classes.

Academic Service

Program Committee Member.

o RP. *International Conference on Reachability Problems 2025, 2024*

External Reviewer/Sub-Reviewer (Conferences).

o CASC. *Computer Algebra in Scientific Computing 2022*
o CONCUR. *International Conference on Concurrency Theory 2023*
o ICALP. *International Colloquium on Automata, Languages, and Programming 2025, 2023, 2020*
o ISSAC. *International Symposium on Symbolic and Algebraic Computation 2024*
o LICS. *Symposium on Logic in Computer Science 2025*
o MFCS. *International Symposium on Mathematical Foundations of Computer Science 2023, 2021*
o POPL. *Principles of Programming Languages 2023*
o SODA. *Symposium on Discrete Algorithms 2024*
o STACS. *Symposium on Theoretical Aspects of Computer Science 2025, 2023*
o STOC. *Symposium on Theory of Computing 2025, 2024*
o TACAS. *Conference on Tools and Algorithms for the Construction and Analysis of Systems 2023*

External Reviewer/Sub-Reviewer (Journals).

o Ex. Countex. *Examples and Counterexamples*
o FI. *Fundamenta Informaticae*
o Int. J. Math. Comput. Sci. *International Journal of Mathematics and Computer Science*
o J. Symbolic Comput. *The Journal of Symbolic Computation*
o TOPLAS. *ACM Transactions on Programming Languages and Systems*

Workshop Organiser.

o *Workshop on Loop Invariants and Algebraic Reasoning*, ICALP 2025 Satellite Workshop.
o *Workshop on Reachability, Recurrences, and Loops*, ICALP 2023 Satellite Workshop.

Autobóz, *Annual Research Camp on Automata, Logic, and Games*.

o **Steering Committee,** 2023–
o **Organiser,** Autobóz 2023 (16–22 July) in partnership with the *Highlights Collaborative Research Week*.
o **Speaker** at Autobóz 2023 (Tutorials on Decision Problems for Linear Recurrence Sequences).

Departmental & University Service

Pay and remuneration committee for sessional teachers, *Warwick*. **2015–2017**

Staff & Graduate Student Liaison Committee (Mathematics), *Warwick*. **2014–2017**

Professional Development

Academic Leadership Development Course, *Informatics Europe*.

Effective Research Project Proposal Writing for Public Funding, *TU Wien*.

Cultivating Research-rich Education and Training Excellence (FHEA certified), *University of Bristol*.

Postgraduate Award in Teaching and Learning in Higher Education (AFHEA certified), *University of Warwick*.

Referees

Professor James Worrell
Department of Computer Science
University of Oxford
Oxford, OX1 3QD
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✉ jbw@cs.ox.ac.uk

Professor Joël Ouaknine
Max Planck Institute for Software Systems
Saarland Informatics Campus
66123 Saarbrücken
Germany
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Professor Laura Kovács
Faculty of Informatics
Vienna University of Technology
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Dr Paul Bell
School of Computer Science and Mathematics
Liverpool John Moores University
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