George Kenison

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Research Experience

Research Interests: Decision Problems, Formal Methods, Automated Verification, Linear Dynamical Systems.

Postdoctoral Researcher in Automated Reasoning and Program Analysis., **May 2021–**
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*. **2017**
Thesis: Asymptotics in conjugacy classes for free groups. EPSRC doctoral award funding.

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

Publications and Preprints

2023a (with L. Kovács and A. Varonka). *From Polynomial Invariants to Linear Loops*. arXiv: 2302.06323.

2023b (with K. Nosan, M. Shirmohammadi, and J. Worrell). *The Hypergeometric Membership Problem with Quadratic Parameters*. Submitted.

2023c (with J. Nieuwveld, J. Ouaknine, and J. Worrell). *The Positivity Problem for Reversible Linear Recurrence Sequences*. Submitted.

2022a. *A Transcendental approach to decision problems for hypergeometric sequences*. arXiv: 2211.02447.

2022b. "On the Skolem Problem for Reversible Sequences". In: *International Symposium on Mathematical Foundations of Computer Science, MFCS 2022*, 61:1–61:15. DOI: 10.4230/LIPIcs.MFCS.2022.61.

2022c (with D. Amrollahi, E. Bartocci, L. Kovács, M. Moosbrugger, and M. Stankovič). "Solving Invariant Generation for Unsolvable Loops". In: *Static Analysis*. Radhia Cousot Award winning paper. Springer Nature Switzerland, pp. 19–43. DOI: 10.1007/978-3-031-22308-2_3.

2021a (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*. Submitted. arXiv: 2007.12282.

2021b (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. DOI: 10.4230/LIPIcs.MFCS.2021.67.

2020 (with R. Lipton, J. Ouaknine, and J. Worrell). "On the Skolem Problem and prime powers". In: *International Symposium on Symbolic and Algebraic Computation, ISSAC 2021*. ACM. DOI: 10.1145/3373207.3404036.

2019 (with R. Sharp). "Statistics in conjugacy classes in free groups". In: *Geom. Dedicata* 198.1, pp. 57–70. DOI: 10.1007/s10711-018-0329-2.

2017 (with R. Sharp). "Orbit counting in conjugacy classes for free groups acting on trees". In: *J. Topol. Anal.* 9.4, pp. 631–647. DOI: 10.1142/S1793525317500261.

Teaching Experience

Co-lecturer for MSc seminar 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*, *Lebesgue 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*, and *Dynamical Systems*.

Fellow of the Higher Education Academy, *Professional Qualification*.

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."

Seminar Talks

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, *Oxford*. **Feb 2019**

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

Statistics in conjugacy classes in free groups, *Warwick*. **Jan 2018**

Statistics in conjugacy classes in free groups, *Bristol*. **Nov 2017**

Comparing length functions on free groups, *Warwick*. **May 2017**

Asymptotics in conjugacy classes for free groups, *Manchester*. **Nov 2017**

Orbit counting in conjugacy classes for free groups acting on trees, *Warwick*. **Nov 2015**

Conference and Workshop Talks

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 the Skolem Problem for Reversible Sequences, *Paris*, **June 2022**
Highlights of Logic, Games, and Automata.

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.

Skolem meets Euclid, *Moorea*, **June 2019**
Workshop on Dynamical Systems and Computation.

Asymptotics in conjugacy classes for group actions, *St Andrews*, **Aug 2016**
Young Researchers In Mathematics.

Asymptotics for free group actions, *Manchester*, **June 2016**
Workshop on Dynamical Systems, Ergodic Theory and Applications.

Orbit counting in conjugacy classes for free groups acting on trees, *Goettingen*, **Sept 2015**
Summer School on Dynamical Approaches in Spectral Geometry.

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 masterclasses, and problem solving classes*. **2012–2019**

Academic Service

External Reviewer/Sub-Reviewer, *TACAS* 2023, *POPL* 2023, *STACS* 2023, *CASC* 2022, *MFCS* 2021, *ICALP* 2020, *J. Math. Comput. Sci*.

Organiser, *Workshop on Reachability, Recurrences, and Loops*, ICALP 2023 Satellite Workshop.

Organiser, *Autobóz Workshop* 2023, in partnership with the *Highlights Collaborative Research Week 2023*.

Departmental & University Service

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

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