CV: Robert D. Gray

Employment and academic history

2024–present	Professor of Mathematics, University of East Anglia, UK.
2022–2027	EPSRC Research Fellow, University of East Anglia, UK.
	– Principal Investigator of 5-year Research Fellowship that runs until autumn 2027.
2020–2024	Reader in Pure Mathematics, University of East Anglia, UK.
2017–2020	Senior Lecturer in Pure Mathematics, University of East Anglia, UK.
2013–2017	Lecturer in Pure Mathematics, University of East Anglia, UK.
	– Awarded for outstanding performance (special increment), June 2016.
2010–2013	Research Fellow, Centre of Algebra of the University of Lisbon, Portugal.
2008–2010	EPSRC Postdoctoral Research Fellow, School of Mathematics, University of St Andrews, UK.
2006–2008	Research Fellow, School of Mathematics, University of Leeds, UK.
2002–2006	PhD in Pure Mathematics, School of Mathematics, University of St Andrews, UK.
1998–2002	M.Sci Hons. Mathematics, first class (averaged 19.99 points out of 20) School of Mathematics, University of St Andrews, UK.
	Class medals for best performance in honours mathematics (2001, 2002).
	Arthur Hinton Read Memorial Prize for showing the greatest distinction in senior honours pure mathematics (2002).
	IMA Prize for outstanding performance in the final year of degree (2002).
	Carnegie Trust Vacation Scholarship Training for Algebra Research (Summer 2001).

Visiting positions

2017–present	Visiting Professor in Algebra and Mathematical Logic, Faculty of Science, University of Novi Sad, Serbia (a lifelong honorary position providing financial support for research collaboration with Prof Igor Dolinka).

Track record of research funding: Grants and Fellowships

- *EPSRC Research Fellowship* (EPSRC Reference: EP/V032003/1). Principal (sole) investigator on a 5-year EPSRC Fellowship project, 2022–2027, total FEC value of grant awarded £1,499,920.
  - Project ranked first both in EPSRC Mathematical Sciences Prioritisation Panel, 17th May 2021, and in EPSRC Mathematical Sciences Fellowship Interviews, 12th July 2021, Panel B.

- *EPSRC First Grant* (EPSRC Reference: EP/N033353/1). Principal (sole) investigator on EPSRC project, 2016–2018, total FEC value of grant awarded £125,720.
  - Project ranked first among First Grants at Mathematics Prioritisation Panel Meeting, 8th June 2016.

- *EPSRC Postdoctoral Research Fellowship* (EPSRC Reference: EP/E043194/1). Principal (sole) investigator on 3-year EPSRC Fellowship project 2008–2010, total FEC value of grant awarded £253,820.

- *University of Sydney Mathematical Research Institute (SMRI), International Visitor Program*, grant to fund an 8-week research visit to the SMRI, spring 2023, total value $8500 Australian dollars = £4800.

- *London Mathematical Society Undergraduate Research Bursary*, summer 2022, total value £1350.00.

- *London Mathematical Society Scheme 4 grant*, to fund a one-week research visit of Prof. B. Steinberg of the CNUY, USA to the University of East Anglia, summer 2019, total value £1000.00.

- *London Mathematical Society Scheme 4 grant*, to fund a one-week research visit of Prof. I. Dolinka of the University of Novi Sad, Serbia to the University of East Anglia, summer 2016, total value £870.00.

- *London Mathematical Society Undergraduate Research Bursary*, summer 2014, total value £1,080.00.

- *FCT Ciência Research Fellowship*. A personal fellowship held at University of Lisbon, 2010–2013.

- *British Council (Portuguese/British) Treaty of Windsor Award*, to fund research collaboration between University of St Andrews and the University of Lisbon, 2009-2010, total value £2,000.

- *Heilbronn Institute for Mathematical Research – Focused Research Grants (FRG), 2025* Co-wrote with Dr Alex Levine successful application for £6,190 to host an event in May 2025 at UEA to bring together experts in equations in semigroups, inverse monoids and decision problems to study the Diophantine problem in one-relator inverse monoids.

Refereed research publications

- 60 publications in peer-reviewed journals, and a further 4 papers submitted for publication currently under review, all available as preprints on the arXiv.
- According to Google Scholar, on 7th July 2025 my publications have: 891 citations, an h-index of 18, and an i10-index of 36.

Refereed Research Publications

[1] Maximal subgroups of finitely presented special inverse monoids (with M. Kambites). *Journal of the European Mathematical Society (JEMS)*, to appear (2025), https://arxiv.org/abs/2212.04204.

[2] Projection algebras and free projection- and idempotent-generated regular $*$-semigroups (with J. East, P. A. Azeef Muhammed, N. Ruskuc). *Advances in Mathematics*, to appear (2025), https://arxiv.org/abs/2406.09109.

[3] Subgroups of E-unitary and $\mathcal{R}_1$-injective special inverse monoids (with M. Kambites). *Mathematische Zeitschrift*, to appear (2025), https://arxiv.org/abs/2306.17787.

[4] Membership problems for positive one-relator groups and one-relation monoids (with I. Foniqi and C.-F. Nyberg-Brodda). *Canadian Journal of Mathematics*, to appear (2025), https://arxiv.org/abs/2305.15672.

[5] Topological finiteness properties of monoids. Part 2: special monoids, one-relator monoids, amalgamated free products, and HNN extensions (with B. Steinberg). *Documenta Mathematica*, (2024), 29(3), 511–560. https://doi.org/10.4171/DM/959.

[6] On groups of units of special and one-relator inverse monoids (with N. Ruskuc) *Journal of the Institute of Mathematics of Jussieu* (2024), 23(4), 1875–1918, https://doi.org/10.1017/S1474748023000439.

[7] Prefix monoids of groups and right units of special inverse monoids (with I. Dolinka). *Forum of Mathematics, Sigma* (2023), Vol. 11:e97 1–19. https://doi.org/10.1017/fms.2023.99.

[8] Topological finiteness properties of monoids. Part 1: Foundations (with B. Steinberg), *Algebraic and Geometric Topology* Vol. 22 (7), 3083–3170, (2022) https://doi.org/10.2140/agt.2022.22.3083.

[9] Algorithmic properties of inverse monoids with hyperbolic and tree-like Schützenberger graphs (with P. Silva & N. Szakacs). *Journal of Algebra* Vol. 611, 1 December 2022, pp. 651–687. https://doi.org/10.1016/j.jalgebra.2022.07.029.

[10] A Lyndon's Identity theorem for one-relator monoids (with B. Steinberg). *Selecta Mathematica, New Series* Vol. 28, 59 (2022). https://doi.org/10.1007/s00029-022-00773-3.

[11] Free inverse monoids are not FP_2 (with B. Steinberg), *Comptes Rendus Mathématique* Vol. 359, issue 8 (2021), pp. 1047–1057.

[12] On equations and first-order theory of one-relator monoids (with A. Garreta), *Information and Computation* Volume 281, December 2021, 104745. https://arxiv.org/abs/1908.00098.

[13] Ehresmann theory and partition monoids (with J. East), *Journal of Algebra* Vol. 579, 2021, pp. 318–352.

[14] New results on the prefix membership problem for one-relator groups (with I. Dolinka), *Transactions of the American Mathematical Society* Vol. 374, 2021, pp. 4309–4358.

[15] Undecidability of the word problem for one-relator inverse monoids via right-angled Artin subgroups of one-relator groups. *Inventiones Mathematicae* Vol. 219, 2020, pp. 987–1008.

[16] On cogrowth, amenability and the spectral radius of a random walk on a semigroup (with M. Kambites). *International Mathematics Research Notices (IMRN)* Vol. 2020, No. 12, pp. 3753–3793.

[17] Crystal bases, finite complete rewriting systems, and biautomatic structures for Plactic monoids of types A_n, B_n, C_n, D_n, and G_2 (with A. J. Cain and A. Malheiro). *Journal of Combinatorial Theory, Series A* Vol. 162, 2019, pp. 406–466.

[18] Permutation monoids and MB-homogeneity for graphs and relational structures (with T. Coleman and D. Evans). *European Journal of Combinatorics* Vol. 78, 2019, pp. 163–189.

[19] Universal locally finite maximally homogeneous semigroups and inverse semigroups (with I. Dolinka). *Forum Mathematicum* Vol. 30(4), 2018, pp. 947–971. https://doi.org/10.1515/forum-2017-0074

[20] On finite complete rewriting systems, finite derivation type, and automaticity for homogeneous monoids (with A. J. Cain and A. Malheiro). *Information and Computation* Vol. 255, 2017, pp. 68–93. https://doi.org/10.1016/j.ic.2017.05.003

[21] Amenability and geometry of semigroups (with M. Kambites). *Transactions of the American Mathematical Society* Vol. 369, 2017, pp. 8087–8103. http://dx.doi.org/10.1090/tran/6939

[22] On regularity and the word problem for free idempotent generated semigroups (with I. Dolinka and N. Ruskuc). *Proceedings of the London Mathematical Society* Vol. 114, 2017, pp. 401–432. DOI: 10.1112/plms.12011

[23] Diagram monoids and Graham–Houghton graphs: idempotents and generating sets of ideals (with J. East). *Journal of Combinatorial Theory, Series A* Vol. 146, 2017, pp. 63–128.

[24] Motzkin monoids and partial Brauer monoids (with I. Dolinka and J. East). *Journal of Algebra* Vol. 471, 2017, pp. 251–298.

[25] Automorphism groups of countable algebraically closed graphs and endomorphisms of the random graph (with I. Dolinka, J. D. McPhee, J. D. Mitchell, and M. Quick). *Mathematical Proceedings of the Cambridge Philosophical Society* Vol. 160, 2016, pp. 437–462.

[26] Ends of Semigroups (with S. Craik, V. Kilibarda, J. D. Mitchell and N. Ruskuc) *Semigroup Forum* Vol. 93, 2016, pp. 330–346.

[27] Rewriting systems and biautomatic structures for Chinese, hypoplactic, and Sylvester monoids (with A. J. Cain and A. Malheiro). *International Journal of Algebra and Computation* Volume 25, no. 1-2, February & March 2015. DOI: 10.1142/S0218196715400044.

[28] Finite Gröbner–Shirshov bases for Plactic algebras and biautomatic structures for Plactic monoids (with A. J. Cain and A. Malheiro). *Journal of Algebra* Vol. 423, 2015, pp. 37–53.

[29] A strong geometric hyperbolicity property for directed graphs and monoids (with M. Kambites). *Journal of Algebra* Vol. 420, 2014, pp. 373–401.

[30] The minimal number of generators of a finite semigroup. *Semigroup Forum* Vol. 89, 2014, pp. 135–154.

[31] Homotopy bases and finite derivation type for subgroups of monoids (with A. Malheiro). *Journal of Algebra* Vol. 410, 2014, pp. 53–84.

[32] Countable locally 2-arc-transitive bipartite graphs (with J. K. Truss). *European Journal of Combinatorics* Vol. 39, 2014, pp. 122–147

[33] On residual finiteness of monoids, their Schützenberger groups and associated actions (with N. Ruskuc). *Journal of Algebra* Vol. 407, 2014, pp. 21–45

[34] Maximal subgroups of free idempotent generated semigroups over the full linear monoid (with I. Dolinka), *Transactions of the American Mathematical Society* Vol. 366, 2014, pp. 419–455

[35] Ideals and finiteness conditions for subsemigroups (with V. Maltcev, J. D. Mitchell and N. Ruskuc). *Glasgow Mathematical Journal* Vol. 56, 2014, pp. 65–86

[36] Quasi-isometry and finite presentations for left cancellative monoids (with M. Kambites). *International Journal of Algebra and Computation* Vol. 23, 2013, pp. 1099–1114

[37] Groups acting on semimetric spaces and quasi-isometries of monoids (with M. Kambites), *Transactions of the American Mathematical Society* Vol. 365, 2013, pp. 555–578

[38] Homotopy bases and finite derivation type for Schutzenberger groups of monoids (with A. Malheiro and S. J. Pride), *Journal of Symbolic Computation* Vol. 50, 2013, pp. 50–78.

[39] On maximal subgroups of free idempotent generated semigroups (with N. Ruskuc), *Israel Journal of Mathematics* Vol. 189, 2012, pp. 147–176.

[40] Green index in semigroups: generators, presentations and automatic structures (with A. J. Cain and N. Ruskuc), *Semigroup Forum* Vol. 85, 2012, pp. 448–476.

[41] Set-homogeneous directed graphs (with D. Macpherson, C. Praeger and G. Royle), *Journal of Combinatorial Theory, Series B*, Vol. 102, 2012, pp. 474–520.

[42] Maximal subgroups of free idempotent generated semigroups over the full transformation monoid (with N. Ruskuc), *Proceedings of the London Mathematical Society* (3) Vol. 104, 2012, pp. 997–1018.

[43] A Svarc–Milnor lemma for monoids acting by isometric embeddings (with M. Kambites), *International Journal of Algebra and Computation*, Vol. 21, 2011, pp. 1135–1147.

[44] Presentations of inverse semigroups, their kernels and extensions (with C. Carvalho and N. Ruskuc), *Journal of the Australian Mathematical Society*, Vol. 90, 2011, pp. 289–316.

[45] Homological finiteness properties of monoids, their ideals and maximal subgroups (with S. J. Pride), *Journal of Pure and Applied Algebra*, Vol. 215, 2011, pp. 3005–3024.

[46] On properties not inherited by monoids from their Schutzenberger groups (with A. Malheiro and S. J. Pride). *Information and Computation*, Vol. 209, 2011, pp. 1120–1134.

[47] Generators and relations for subsemigroups via boundaries in Cayley graphs (with N. Ruskuc), *Journal of Pure and Applied Algebra*, Vol. 215, 2011, pp. 2761–2779.

[48] Locally-finite connected-homogeneous digraphs (with R. Möller), *Discrete Mathematics*, Vol. 311, 2011, pp. 1497–1517.

[49] Finite complete rewriting systems for regular semigroups (with A. Malheiro), *Theoretical Computer Science*, Vol. 412, 2011, pp. 654–661.

[50] Countable connected-homogeneous graphs (with D. Macpherson), *Journal of Combinatorial Theory, Series B*, Vol. 100, 2010, pp. 97–118.

[51] Cycle-free partial orders and ends of graphs (with J. K. Truss), *Mathematical Proceedings of the Cambridge Philosophical Society* , Vol. 146, 2009, pp. 535–550.

[52] On residual finiteness of direct products of algebraic systems (with N. Ruskuc), *Monatshefte für Mathematik*, Vol. 158, 2009, pp. 63–69.

[53] k-CS-transitive infinite graphs, *Journal of Combinatorial Theory, Series B*, Vol. 99, 2009, pp. 378–398.

[54] Construction of some countable one-arc transitive bipartite graphs (with J. K. Truss), *Discrete Mathematics*, Vol. 308, 2008, pp. 6392–6405.

[55] Green index and finiteness conditions for semigroups (with N. Ruskuc), *Journal of Algebra*, Vol. 320, 2008, pp. 3145–3164.

[56] Construction of some uncountable 2-arc-transitive bipartite graphs (with M. Droste and J. K. Truss), *Order*, Vol. 25, 2008, pp. 349–357.

[57] Hall's condition and idempotent rank of ideals of endomorphism monoids, *Proceedings of the Edinburgh Mathematical Society*, Vol. 51, 2008, pp. 1–16.

[58] Largest subsemigroups of the full transformation monoid (with J. D. Mitchell), *Discrete Mathematics*, Vol. 308, 2008, pp. 4801–4810.

[59] Idempotent rank in endomorphism monoids of finite independence algebras, *Proceedings of the Royal Society of Edinburgh: Section A Mathematics*, Vol. 137A, 2007, pp. 303–331.

[60] Generating sets of completely 0-simple semigroups (with N. Ruskuc), *Communications in Algebra*, Vol. 33, 2005, pp. 4657–4678.

Submitted Papers

[61] Membership problems in braid groups and Artin groups (with C.-F. Nyberg-Brodda). Submitted, 20 pages. https://arxiv.org/abs/2409.11335.

[62] Two-sided homological properties of special and one-relator monoids (with B. Steinberg). Submitted, 22 pages. https://arxiv.org/abs/2507.04819.

[63] Twisted products of monoids (with J. East, P. A. Azeef Muhammed, N. Ruskuc). Submitted, 34 pages. https://arxiv.org/abs/2507.04486

[64] Maximal subgroups of free projection- and idempotent-generated semigroups with applications to partition monoids (with J. East, P. A. Azeef Muhammed, N. Ruskuc). Submitted, 72 pages. https://arxiv.org/abs/2507.06600

Invited talks (45+ invited conference / workshop talks & 45+ invited seminar talks)

Recent invited & plenary talks at conferences & workshops attracting international participation 2015-present:

- Invited Morning Speaker at the British Mathematical Colloquium, Manchester, June 2024.
- Conference on Theoretical and Computational Algebra, Aveiro, Portugal, July 2024.
- AAA105, 105th Workshop on General Algebra, Charles University, Prague, June 2024.
- North British Semigroups and Applications Meeting, York, November 2023.
- Conference on Theoretical and Computational Algebra, Pocinho, Portugal, July 2023.

- Groups and Geometry in South East Meeting, Warwick, March 2023.
- Topics in geometric semigroup theory, York, 20-23 June 2022.
- Recent Trends in Semigroup Theory, AMS online meeting, University of Denver, May 2022.
- North British Geometric Group Theory meeting, online, October 2020.
- North British Semigroups and Applications Meeting, online, July 2020.
- 'Semigroups and connections with other fields' at Cochin University, India, December 2019.
- "Semigroups and Groups, Automata, Logics", 10th-13th June 2019, Cremona Italy.
- North British Semigroups and Applications Meeting, York, 10th January 2019.
- ICMS research group: "Solving equations in one-relator groups/semigroups" Edinburgh Sept. 3-7, 2018.
- Conference in honour of Prof Dugald MacPherson, ICMS Edinburgh, September 2018.
- International conference in honour of Prof John Rhodes, Bar-Ilan, Israel, June 2018.
- Conference in honour of Prof. J. K. Truss, University of Leeds, September 10th-Septmber 12th, 2017.
- Conference in honour of Prof. Peter J Cameron, Lisbon, 24-27 July 2017.
- Recent Trends in Semigroup Theory, AMS meeting special session, University of Denver, October 2016.
- CSA 2016, International Conference on Semigroups and Automata Lisbon, 20–24th June 2016.
- North British Semigroups and Applications Meeting, University of York, May 2016.
- Open University Winter Combinatorics Meeting, The Open University, Milton Keynes, January 2016.
- Homogeneous Structures, Banff International Research Station, Banff, Canada, November 2015.
- Permutation groups and transformation semigroups, LMS Durham Research Symposium, July 2015.
- The Algebraic Theory of Semigroups and Applications special session at a joint meeting of the American, European and Portuguese Mathematical Societies, Porto, Portugal, June 2015.
- AAA90, 90th Workshop on General Algebra, Novi Sad, Serbia, June 2015.
- North British Semigroups and Applications Meeting, University of St Andrews, April 2015.

Earlier invited conference talks: Between 2004 and 2014 I gave 19 invited talks at conferences / workshops with international participation at the universities: *Bar-Ilan University (Israel), ICMS Edinburgh, University of Lisbon, University of Uppsala (Sweden), University of Novi Sad (Serbia), University of Manchester, University of Leeds, University of St Andrews, Erwin Schrodinger International Institute (Vienna, Austria), University of York, Banff International Research Station (Canada), University of Newcastle.*

Recent invited seminar / colloquium talks at universities in the UK and abroad 2019-present:

- ICMAT, Madrid, invited group theory seminar, May 2025.
- SLADIM+ Seminar for Logic, Algebra and Discrete Mathematics, University of Novi Sad, Serbia, September 2024.
- Invited Mathematics Colloquium at the Sydney Mathematical Research Institute, Sydney, May 2023.
- Invited Algebra Seminar at the University of Sydney, May 2023.
- Invited Pure Maths Colloquium, University of Southampton, February 2023.
- Invited seminar at Semigroups, Automata and Languages at CMUP, Porto, Portugal, November 2022.
- Invited seminar University of Hertfordshire, May 2021.
- Invited seminar University of the Basque Country, Bilbao, March 2021.
- Invited seminar at Semigroups, Automata and Languages at CMUP, Porto, Portugal, March 2021.
- Invited online talk at Western Sydney University Abend Seminar, August 2020.
- Invited Algebra, Logic, and Algorithms Seminar, University of Leeds, October 2019.
- Invited Algebra Seminar, Aberdeen University, October 2019.
- Invited seminar, University of York, 6th March 2019.

Earlier invited seminars: Between 2004 and 2018 I have given 34 invited seminars / colloquium talk at the following universities: *Newcastle University, Heriot-Watt University, University of Novi Sad (Serbia), University of Warwick, University of Leeds, University of Manchester, University of St Andrews, University of Lisbon, Universidade Nova de Lisboa, University of York, University of Colorado Boulder, University of Linz (Austria), University of Essex, University of Porto, University of Glasgow, University of Edinburgh, University of Newcastle.*

Research supervision

I have successfully supervised as primary (90%) supervisor the following 4 research students at UEA:

- MSc by Research student Daniel Turaev, passed his viva in August 2024.

- PhD student Carl-Fredrik Nyberg Brodda, passed his viva in December 2021.
- PhD student Diane Lubbock, passed her viva in November 2020.
- PhD student Thomas Coleman, passed his viva in June 2017.

I am currently the primary (90%) supervisor for the following PhD students at UEA:

- PhD student Katie Reilly, 2023–present.
- PhD student Jonathan Warne, 2021–present.

    I am currently also supervising the following Senior Research Associates at UEA:

    ○ Postdoctoral Researcher Dr Alex Levine, 2024–present.
    ○ Postdoctoral Researcher Dr Islam Foniqi, 2022–present.

Second supervisor: I have been the second supervisor for numerous (8+) PhD students at UEA since 2013, and I have been been on the Probationary Review Panel (as assessor) of several UEA PhD students.
I created and supervised the following undergraduate summer research projects at UEA:

- London Mathematical Society Undergraduate Research Bursary "Monoids on surfaces", 2022.
- London Mathematical Society Undergraduate Research Bursary "Amenability of Semigroups", 2014.
- "Synchronizing automata and the Cerny conjecture", 2015. I supervised a student who worked on this project. This student went on to obtain a PhD in mathematics from the University of Manchester.

- I have supervised 12 undergraduate and 8 MMTH-level projects at the UEA between 2013 and 2022.
- I assisted supervising PhD students, Simon Craik and Jay McPhee, University of St Andrews, 2008–2010.

Examination of internal and external PhD and MSc by Research students

- External examiner for PhD candidate George Kontogeorgiou (University of Warwick, 2023).
- External examiner for MSc by Research candidate Marc Hughes (University of Hertfordshire, 2022).
- Internal examiner for for PhD candidate George Witty (UEA, 2020).
- External examiner for PhD candidate Emma McDougall (Heriot-Watt University, 2018).
- Internal examiner for PhD candidate Andrew Langworthy (UEA, 2018).
- External examiner for PhD candidate Bruno Federici (University of Warwick, 2017).
- External examiner for PhD candidate Chwas Ahmed (University of Leeds, 2016).
- External examiner for PhD candidate Dandan Yang (University of York, 2014).
- External examiner for PhD candidate Yanhui Wang (University of York, 2012).
- External examiner for PhD candidate Imtiaz Ahmad (University of Essex, 2011).

Editorial Work, Reviewing and EPSRC College Membership

- Member of Editorial Board of *International Journal of Algebra and Computation (IJAC)*, 2020-present.
  ○ published by World Scientific, 2022 Impact Factor 0.8.
- EPSRC Full College Member (2017-present).

  ○ *Recognised for significant contribution to EPSRC Peer Review* - officially recognised for achieving a ranking in the top 6% of College members for participating in peer review activities during the last academic year (2019/20).
- EPSRC Peer Review Associate College Member (2016-2017).
- Grant proposal reviewer for EPSRC.

  ○ I have reviewed numerous Standard Proposals and also EPSRC Fellowship Proposals.
  ○ I was invited to be a member of an EPSRC Mathematics Prioritisation Panel, summer 2017.
- Reviewer for *EPSRC New Horizons* call, summer and autumn 2020.
- Participant at the EPSRC ICMS virtual "Big Ideas Workshop", July 2020.
- Reviewer of research proposals for the Czech Science Foundation `www.gacr.cz/en`, the main public funding agency in the Czech Republic supporting all areas of basic research, August 2024.
- Book reviewer for the London Mathematical Society.
- Referee for 30+ international mathematics journals including: *Advances in Mathematics*, *Proceedings of the London Mathematical Society*, *Transactions of the American Mathematical Society*, *Proceedings of the American Mathematical Society*, *IMRN*, *Journal of the Institute of Mathematics of Jussieu*, *Canadian Journal of Mathematics* and *Israel Journal of Mathematics*.

International research networks and collaborations

- NBSAN North British Semigroups and Applications LMS network member 2013-present.
- Named collaborators on current *EPSRC Fellowship*, EP/V032003/1 (2022-2027) from the UK (Manchester, Heriot–Watt), USA, Australia, Germany, France, Portugal, Spain, and Serbia.
- Project Partners on current *EPSRC Fellowship*, EP/V032003/1 (2022-2027)
  - Prof Ben Steinberg of City College of New York, USA
  - Prof Igor Dolinka of University of Novi Sad, Serbia
- Project partners on my EPSRC First Grant Grant EP/N033353/1 (2016-2018)
  - City University of New York, NOVA University of Lisbon, University of Manchester, The University of Novi Sad, University of St Andrews.
- I have a broad network of collaborators, with current and past collaborators from universities in the: UK, USA, France, Germany, Portugal, Spain, Serbia, Israel, Australia and Iceland.

Outreach, impact, engagement and widening participation

- *Norwich Science Festival "Funfair of Impossible Problems"* Designed and ran an activity stand at Norwich Science Festival using mathematical games to explain the notion of undecidable problems, February 2024.
- "Exploring impossible problems", wrote essay for *MTH Newsletter* sent to schools explaining the research of my EPSRC fellowship project in a way accessible to 16 year olds, Autumn 2023.
- *London Mathematical Society Graduate Student Meeting*, June 2019. Gave an invited talk to introduce students to topics in LMS Aitken Lecture by Professor Bakh Khoussainov later that day.
- Helper for Year 6 quiz at UEA, Weds 19th June 2019.
- *LMS Undergraduate Summer Schools*, University of Glasgow, July 2018 and University of Manchester, July 2017. Gave invited three lecture mini-courses based on topics from my *EPSRC First Grant* to introduce modern research mathematics to UK undergraduates.
- UEA summer school, July 2017 and 2016. Gave a session on modular arithmetic and cryptography.
- *Escola de Álgebra, XXIV Brazilian Algebra Meeting*, Diamantina, Brazil August, 2016. Gave invited mini-course to masters and PhD students on topics from my *EPSRC First Grant* project.
- *UKMT Summer School for Girls*, Oxford, August 2015, August 2014, and August 2013. Gave interactive session: "The Futurama Problem: How not to lose your mind using group theory".
- *Essex higher education convention 30 June - 01 July 2015 — Anglia Ruskin University, Chelmsford Campus.* General talk to A-level students on benefits of studying mathematics at university.
- *Fronteiras da Matemática* workshop at the University of Lisbon in April 2010. Gave invited talk to give undergraduate students an introduction to modern research in mathematics.
- We invited a group of three bright Year 13 students studying A-Level maths at Taverham Sixth Form to attend one of my first year maths lectures in December, 2014. These students were interested in applying to study maths at UEA, but had no family history of attending university.
- Gave at talk at the "Meet the lecturer", UEA Mathematics Society event (11th November, 2014).
- Gave a series of lectures entitled "Residual Finiteness of Algebraic Structures" to undergraduates as part of the *St Andrews Summer Research School 2008*.
- A research result of mine published in 2020 is included in the recent popular maths book "Landscape of 21st Century Mathematics Selected Advances, 2001–2020" by Bogdan Grechuk. This is a popular maths book which "...presents an array of breathtaking recent advances in mathematics".
- A research result of mine was described as an outstanding contribution to research in an article published in the "Online Newspaper of Cremona", Italy, in 2019.

Event organisation

- Scientific Committee member for the conference on Theoretical and Computational Algebra 2024.
- Organised a two-day North British Semigroups and Applications Network meeting, UEA, June 2023.
- Scientific Committee member for the conference Applied Classical and Constructive Semigroups (ACaCS 2021) Niš, Serbia, September 2021.
- Organised a three-day conference WOW – Winter One-relator Workshop at UEA in January 2018 as part of my EPSRC First Grant, with 11 invited speakers from USA, Israel, Hungary, Serbia, and the UK.
- Organised "Tomorrow's Mathematicians Today at UEA", undergraduate maths talks, February 2016.
- Member of the Scientific Committee for, the international conference *AAA90, 90th Workshop on General Algebra - 90. Arbeitstagung Allgemeine Algebra*, Novi Sad, Serbia, June 2015.

- Organised a two-day North British Semigroups and Applications Network meeting, UEA, April 2014.
- Organiser of the Semigroups, Automata and Languages seminar, University of Lisbon, spring 2012.

Mentoring

- Mentor for Senior Research Fellow, Dr Alex Levine, 2024-present.
- Mentor for Senior Research Fellow, Dr Islam Foniqi, 2022-present.
- School Mentor for new lecturer at UEA, Mr T. Coleman, 2016-2017.
- Research mentor for lecturer at UEA, Dr Sam Morley, 2019-2020.

Teaching qualifications

2015–present	**Fellow of the Higher Education Academy**
2013–2015	**Postgraduate Certificate in Higher Education Practice**
	University of East Anglia, UK.

Teaching award nominations

- 2017: Nominated for a *UEA Transforming Education Award* for the category *Inspiring Teaching*.
- 2015: Shortlisted for a *UEA Transforming Teaching Award*, in the category *Inspiring Teaching*.
- 2014: Nominated for a *UEA Excellence in Teaching Award*.

Lecturing

At the University of East Anglia I have developed and lectured the following undegradaute modules:

- *Real analysis & Group Theory*, spring 2022, a 1st year module. I developed the materials & taught the group theory component.
- *Further Linear Algebra*, spring 2021, a 2nd year module. I rewrote the module & gave the lectures.
- *Mathematical Skills*, autumn 2020, a 1st year module. I was module organiser for this module.
- *Algebraic Topology*, autumn semester 2021, a 3rd/4th year module. I was module organiser for this module. This was a new module which I created. I wrote all the content for this module lecture notes, exercise sheets, etc.
- *Algeba I: Group theory* Spring 2020, Spring 2021, a 1st year module. I was module organiser for this module in 2020-2021. This was a new module that I designed, creating all the materials.
- *Galois Theory and Galois Theory with Advanced Topics* (Spring 2020); a 3rd/4th year module. I was module organiser.
- *Ring Theory* (Spring 2013, 2014), a 2nd year module; I was module organiser. I redesigned this module when its length doubled.
- *Sets, Numbers and Proof* (Autumn 2013, 2014, 2015, 2017), a 1st year module. I was module organiser for this module in each of these years (apart from 2017);
- *Semigroup Theory* (Spring 2015, Autumn 2016, Autumn 2018); a 3rd/4th year undergraduate course which I designed entirely myself. In 2015, this module was chosen by a large number of students (79 + 9 advanced topics students). I was the module organiser.
- *Linear Algebra* (Spring 2016), a 1st year module. I was the module organiser.

Lectured the following final year undergraduate course in group theory at the University of Leeds.

- *Groups and Symmetry* (Autumn 2007)

Innovative teaching methods

- Live chat running during the lecture allowing the students to type questions, 2019–present.
- Recording lectures using laptop to give clear image of blackboards, 2021–present.
- Getting students to give talks / record "explainer videos", Group Theory 2020–present.
- Online teaching 2020-2021 using iPad and blackboard collaborate to stream and record lectures.
- Mathematical Problem Solving module (2016, 2017): Oral assessment of students (a novel assessment in mathematics); Set up group chat on Facebook with mathematical problem solving group to share photographs of whiteboards on which students had written up their solutions and corrections to other students' solutions (peer marking) on whiteboard walls in the UEA enterprise centre.
- Semigroup Theory (2016, 2018): Group work as part of Formative Assessment. Each group submitted a photograph of their group working on the problems. Then they marked each others' work. Also gave incomplete lecture notes and class was split into teams, and each week one team prepared the solution to one set of lemmas, and then during the lecture they were invited to the board to explain their solutions.

Tutoring, advising, and pastoral care: I have tutored, and run problems classes, for numerous undergraduate courses in mathematics, at the University of East Anglia, University of Leeds, University of St Andrews, and the University of Lisbon (including giving classes in Portuguese). I have also acted as advisor / personal tutor for numerous undergraduate students both at the University of Leeds (Spring 2007 and Autumn 2007) and the University of East Anglia (2013-present). This involved providing both academic guidance and pastoral care.

Director of Admissions for School of Mathematics (2017–2021): As admissions director I worked on several initiatives to improve our admissions position including: significantly redesigning the Open Day subject talk, use of TV screens at Open Days, revamping Applicant Days (with Head of School and Davide Proment), designing and running virtual applicant day events, recording online videos & arranging for undergraduates to record recruitment videos to be used for online open days.

Administrative roles / professional development and other contributions at UEA

- 2017–2021: Director of Admissions for School of Mathematics (in 2019–2020 shared with D. Proment).
- Internal reviewer of UEA grant applications: Spring 2025: Christopher Birkbeck EPSRC First Grant application; Spring 2025: Christopher Birkbeck FLF Future Leader Fellow Grant application; David Aspero EPSRC Open Fellowship, autumn 2023; Samuel Martin EPSRC Fellowship, spring 2023; Shaun Stevens EPSRC Grant, autumn 2020.
- Advised Dr Alberto Alberello on reviewer response for Future Leaders Fellowship (FLF), spring 2024.
- PhD student interview panel member (including for PhD scholarships) numerous times 2013–present.
- Chair of interview panel for Senior Research Fellow, spring 2022.
- Interview panel member for 5-year lectureship, spring 2022.
- Jointly ran CPD course for PhD students "Presenting research in the mathematical sciences", May 2022.
- Jointly ran CPD course for Associate Tutors "Marking and Assessment of Maths", October 2015–2021.
- Deputy Equality, Diversity and Inclusion (EDI) director, spring semester 2022.
- Member of the Dominic Russel Scholarship Panel, July 2021 – a scholarship to support applicants from low income households.
- REF2021 paper reading panel (summer 2019). Member of the committee of 3 pure and 3 applied mathematicians reading and giving uniform marks to research outputs in preparation for the REF.
- Jointly ran First Year Mathematics Induction Lectures, UEA, 2015–2019.
- Science Faculty representative for UEA Senate, academic year 2016–2019.
- Member of the UEA Mathematics School Executive Team / Working Group 2017–2021.
- LMS Summer Bursary applicant sifting panel member, summer 2017.
- Library Liaison Officer, Bookshop liaison, Mathematics Reading Room, 2015–2017.
- Organiser of the University of East Anglia pure mathematics seminar, autumn semester, 2016–2017.
- Co-organiser of the UEA pure maths seminars 2013-2014, and 2014-2015.
- Member of the Maths Engagement Team, 2015-2016.
- Member of the BSc Project Moderation Panel, 2015–2016.
- Nominated member of the UEA School of Mathematics Promotions Committee, 2014–2015.
- Member of the MMTH Project Moderation Panel, 2013–2014 and 2014–2015.
- UEA British Combinatorial Committee representative, 2014–present.
- Devised and delivered UEA applicant day activity "The Futurama problem" which has been delivered by me and others on numerous applicant days 2013–present.
- Organised the "UEA Maths Leaver's Party", in July 2015 and in July 2016.
- Attended meeting of UEA Research Executive Members with School Research Directors, 2016.
- I allowed a PhD student in mathematics education at UEA (Ms Athina Thoma) to use my module Sets, Numbers and Proof (2014–2015) as part of a case study in her PhD.

Professional development: 2013–present: I have attended the following UEA training courses several times: Finance Approval of Expenditure, Recruitment & Selection, Data Protection and GDPR, Display Screen, Diversity, Health and Safety, Staff Appraisal, Safeguarding and Prevent, Best Practice in Research Supervision, Interviewing University Applicants, Equality and Diversity, Introduction to Unconscious Bias.

EPSRC training: Completed EPSRC Online Training course in 2016 which provided valuable information on EPSRC and their strategies and priorities, giving guidance on best practice on reviewing proposals and

training on roles and responsibilities for being part of an EPSRC peer review panel. Attended EPSRC Fellows networking event, Tuesday 16th April 2024.

Professional affiliation Member of London Mathematical Society and Edinburgh Mathematical Society.

Referees

Available on request.