

# CV: Robert Gray

## Personal Information

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Nationality: British    Born: 11 June 1980

## Career History

- 2010–            **Research Fellow**  
Centre of Algebra of the University of Lisbon, Portugal.  
I hold an *FCT Ciência 2008 Research Fellowship*.
- 2008–2010    **EPSRC Postdoctoral Research Fellow**  
School of Mathematics and Statistics, University of St Andrews, UK.
- 2006–2008    **Research Fellow**  
School of Mathematics, University of Leeds, UK. Member of the *Leeds Logic Group* working on the EPSRC funded project *Homogeneous structures, bipartite graphs, and partial orders*.

## Academic Degrees

- 2002–2006    **Ph.D. Pure Mathematics**  
School of Mathematics and Statistics, University of St Andrews, UK.  
Thesis title: *A Graph Theoretic Approach to Combinatorial Problems in Semi-group Theory*.
- 1998–2002    **M.Sci Hons. Mathematics, first class (averaged 19.99 points out of 20)**  
School of Mathematics and Statistics, 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).  
*Institute of Mathematics and its Applications Prize* for outstanding performance in the final year of undergraduate degree (2002).  
*Carnegie Trust Vacation Scholarship* for Training for Algebra Research (Summer 2001).

## Grants and Fellowships

- *EPSRC Postdoctoral Research Fellowship* (EPSRC Reference: EP/E043194/1). Principal (sole) investigator on EPSRC project *Finiteness Conditions and Index in Semigroups and Monoids* (2008–2010, total FEC value of grant awarded £203,056).
- *British Council (Portuguese/British) Treaty of Windsor Award*, to fund research collaboration between the University of St Andrews and the Centre of Algebra of the University of Lisbon (2009–2010, total value £2,000).

## Refereed Research Publications

- [1] Maximal subgroups of free idempotent generated semigroups over the full linear monoid (with I. Dolinka), *Transactions of the American Mathematical Society* (to appear).
- [2] Groups acting on semimetric spaces and quasi-isometries of monoids (with M. Kambites), *Transactions of the American Mathematical Society* (to appear).
- [3] Maximal subgroups of free idempotent generated semigroups over the full transformation monoid (with N. Ruskuc), *Proceedings of the London Mathematical Society* (to appear).
- [4] Homotopy bases and finite derivation type for Schutzenberger groups of monoids (with A. Malheiro and S. J. Pride), *Journal of Symbolic Computation* (to appear).
- [5] On maximal subgroups of free idempotent generated semigroups (with N. Ruskuc), *Israel Journal of Mathematics* (to appear).
- [6] Green index in semigroups: generators, presentations and automatic structures (with A. J. Cain and N. Ruskuc), *Semigroup Forum* (to appear).
- [7] Set-homogeneous directed graphs (with D. Macpherson, C. Praeger and G. Royle), *Journal of Combinatorial Theory, Series B*, Vol. 102, 2012, pp. 474–520.
- [8] 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.
- [9] 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.
- [10] 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.
- [11] 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.
- [12] 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.
- [13] Locally-finite connected-homogeneous digraphs (with R. Möller), *Discrete Mathematics*, Vol. 311, 2011, pp. 1497–1517.

- [14] Finite complete rewriting systems for regular semigroups (with A. Malheiro), *Theoretical Computer Science*, Vol. 412, 2011, pp. 654–661.
- [15] Countable connected-homogeneous graphs (with D. Macpherson), *Journal of Combinatorial Theory, Series B*, Vol. 100, 2010, pp. 97–118.
- [16] 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.
- [17] On residual finiteness of direct products of algebraic systems (with N. Ruskuc), *Monatshefte für Mathematik*, Vol. 158, 2009, pp. 63–69.
- [18]  $k$ -CS-transitive infinite graphs, *Journal of Combinatorial Theory, Series B*, Vol. 99, 2009, pp. 378–398.
- [19] Construction of some countable one-arc transitive bipartite graphs (with J. K. Truss), *Discrete Mathematics*, Vol. 308, 2008, pp. 6392–6405.
- [20] Green index and finiteness conditions for semigroups (with N. Ruskuc), *Journal of Algebra*, Vol. 320, 2008, pp. 3145–3164.
- [21] Construction of some uncountable 2-arc-transitive bipartite graphs (with M. Droste and J. K. Truss), *Order*, Vol. 25, 2008, pp. 349–357.
- [22] Hall’s condition and idempotent rank of ideals of endomorphism monoids, *Proceedings of the Edinburgh Mathematical Society*, Vol. 51, 2008, pp. 1–16.
- [23] Largest subsemigroups of the full transformation monoid (with J. D. Mitchell), *Discrete Mathematics*, Vol. 308, 2008, pp. 4801–4810.
- [24] 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.
- [25] Generating sets of completely 0-simple semigroups (with N. Ruskuc), *Communications in Algebra*, Vol. 33, 2005, pp. 4657–4678.

## Submitted Papers

- [26] Countable locally 2-arc-transitive bipartite graphs (with J. K. Truss). Submitted, 29 pages.
- [27] Quasi-isometry and finite presentations for left cancellative monoids (with M. Kambites). Submitted, 13 pages, [arXiv:math.GR/1204.2384](https://arxiv.org/abs/math/1204.2384).
- [28] Ideals and finiteness conditions for subsemigroups (with V. Maltcev, J. D. Mitchell and N. Ruskuc). Submitted, 25 pages.
- [29] Homotopy bases and finite derivation type for subgroups of monoids (with A. Malheiro). Submitted, 24 pages, [arXiv:math.GR/0912.1284](https://arxiv.org/abs/math/0912.1284).
- [30] On residual finiteness of monoids, their Schützenberger groups and associated actions (with N. Ruskuc). Submitted, 27 pages, [arXiv:math.GR/1003.3176](https://arxiv.org/abs/math/1003.3176).

## Selected Talks and Invited Participations

- Invited talk at *AAA workshop in general algebra and related fields*, University of Novi Sad, Serbia, March 2012.
- Centre of linear and combinatorial structures seminar, (CELC) University of Lisbon, February 2012.
- Semigroups, automata and languages seminar, (CAUL) University of Lisbon, November 2011.
- Pure Mathematics Colloquium, University of Novi Sad, Serbia, November 2011.
- Invited talk at *North British Semigroups and Applications Meeting*, University of Manchester, August 2011.
- Invited talk at *Groups and Semigroups: Interactions and Computations*, University of Lisbon, July 2011.
- Invited talk at *LMS Northern Regional Meeting and Workshop on Homogeneous Structures*, University of Leeds, July 2011.
- Pure Mathematics Colloquium, University of Novi Sad, Serbia, March 2011.
- Pure Mathematics Colloquium, University of Essex, January 2011.
- Semigroups, automata and languages seminar, University of Lisbon, November 2010.
- Semigroups, automata and languages seminar, University of Porto, October 2010.
- Contributed talk at *International Conference on Geometric and Combinatorial Methods in Group Theory and Semigroup Theory*, University of Nebraska-Lincoln, USA, May 2009.
- Invited talk at *North British Semigroups and Applications Meeting*, St Andrews, April 2009.
- Invited talk at *Groups and Infinite Graphs*, Erwin Schrodinger International Institute, Vienna, Austria, September 2008.
- Contributed talk at *ROGICS - International Conference on Relations, Orders and Graphs: Interaction with Computer Science*, Mahdia, Tunisia, May 2008.
- Invited talk at *Algebra Workshop*, Centre of Algebra of the University of Lisbon, April 2008.
- Invited talk at *Splinter Group on Semigroup Theory, 60th British Mathematical Colloquium*, University of York, March 2008.
- Invited talk at *International Conference on Infinite Graph Theory*, Banff International Research Station, Canada, October 2007.
- Invited talk at *Combinatorics of Arc-Transitive Graphs and Partial Orders*, University of Leeds, August 2007.
- Contributed talk at *21st British Combinatorial Conference*, University of Reading, July 2007.
- Invited talk at *One-day meeting of the Cambridge/Leeds/Norwich Set Theory Group (CAMELEON)*, University of Leeds, June 2007.
- Model Theory Seminar, University of Leeds, May 2007.

- Leeds Algebra Seminar, University of Leeds, January 2007.
- Glasgow Algebra Seminar, University of Glasgow, November 2006.
- MAXIMALS Algebra Seminar, University of Edinburgh, November 2006.
- Model Theory Seminar, University of Leeds, May 2006.
- Invited talk at *Splinter Group on Semigroup Theory, 58th British Mathematical Colloquium*, University of Newcastle, April 2006.
- Contributed talk at *International Conference on Semigroups and Languages*, University of Lisbon, July 2005.
- Contributed talk at *PoPMiNE Postgraduate Conference in Pure Mathematics*, University of Newcastle, June 2004.
- Contributed talk at *Splinter Group on Group Theory, 56th British Mathematical Colloquium*, Queens University Belfast, March 2004.

## Travel Grants

Obtained external funding to support the following research visits:

- University of Novi Sad, Serbia (March 2011, October 2011),
- University of Manchester, UK (several visits during 2006-2011),
- The Erwin Schrödinger International Institute for Mathematical Physics, Vienna, Austria (September 2008),
- University of Iceland (June 2007 and June 2008),
- University of Lisbon (several visits during 2008-2010).

## Teaching Experience

### Lecturing

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

- *Groups and Symmetry* (Autumn 2007)  
50+ students, 26 lectures, 7 tutorials, 3 hours per week.

This involved preparing and delivering lectures, preparing tutorial sheets, running problem classes and tutorials, and setting and marking the exam.

### Tutoring

Have tutored numerous undergraduate courses in mathematics, at the University of Leeds, University of St Andrews, and the University of Lisbon (including giving classes in Portuguese), with class sizes ranging from 6 to 40, including:

*Álgebra II* (Spring 2012, Spring 2011), *Teoria de Galois (Galois Theory)* (Spring 2010), *Set Theory* (Autumn 2007), *Group Theory* (Spring 2007), *Graph Theory* (Spring 2005), *Pure and Applied Mathematics* (Spring 2005), *Finite Mathematics* (Spring 2004), *Advanced Semigroup*

*Theory* (Autumn 2004), *Geometry and Analysis* (Autumn 2006), *Discrete Mathematics* (Spring 2003), *Algebra and Analysis* (Autumn 2002, Autumn 2003, Autumn 2004).

Acted as personal tutor to a group of second year students at the University of Leeds (Spring 2007 and Autumn 2007). This involved providing both academic guidance and pastoral care.

## Research Supervision and Examination

- Currently assisting with the supervision of two PhD students of the University of St Andrews.
- External examiner for PhD candidate Imtiaz Ahmad (University of Essex, 2011).
- External examiner for PhD candidate Yanhui Wang (University of York, 2012).

## Refereeing and Reviewing

- Referee for journals including: *Combinatorica*, *Journal of Graph Theory*, *Designs*, *Codes and Cryptography*, *Order*, *European Journal of Combinatorics*, *Discrete Mathematics*, *Communications in Algebra*, *Australasian Journal of Combinatorics*, *Semigroup Forum*, *Ars Combinatoria*, and *Publicationes Mathematicae Debrecen*.
- Regular article reviewer for *Mathematical Reviews* and *MathSciNet*.

## Event Organisation

- Scientific committee member for *The 4th Novi Sad Algebraic Conference*, Summer 2013.
- Organiser of the Semigroups, automata and languages seminar (CAUL) University of Lisbon, Spring 2012.

## Outreach

- Gave an invited presentation entitled “Homogeneous Structures” at the two day *Fronteiras da Matemática* workshop at the University of Lisbon (<http://fronteirasmat.fc.ul.pt/informacoes.php>). The aim of the conference was to give the students a flavour of some current research topics in mathematics, and to encourage them to become involved in masters and Ph.D. programmes in mathematics in the future.
- Wrote a report on the London Mathematical Society Northern Regional Meeting 2011, and three day workshop on Homogeneous Structures, which was published in the London Mathematical Society newsletter 3 October 2011.

## Professional Affiliations

- Member of the London Mathematical Society.
- Member of the Edinburgh Mathematical Society.

## **Referees**

*Available on request.*