

Anthony Henderson

Curriculum Vitae

School of Mathematics and Statistics F07
University of Sydney, NSW 2006
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Citizenship: Australian **Date of Birth:** July 21, 1976

Employment History

- Jan 2012 – present: Associate Professor, University of Sydney.
- Jan 2009 – Dec 2011: Senior Lecturer, University of Sydney.
[Jan – Jun 2010: internal secondment as Senior Research Associate]
- Jan 2007 – Dec 2008: Lecturer, University of Sydney.
- Jul 2001 – Dec 2006: Postdoctoral Research Fellow, University of Sydney.

Degrees Attained

- PhD in Mathematics, Massachusetts Institute of Technology, June 2001, supervised by G. Lusztig.
- BSc with First Class Honours and University Medal in Pure Mathematics, University of Sydney, 1996, supervised by G. I. Lehrer.

Selected Awards and Grants

- Future Fellowship, ‘Springer fibres, nilpotent cones and representation theory’, Australian Research Council, 2012–15.
- Christopher Heyde Medal of the Australian Academy of Science, 2011 (for outstanding pure mathematics researcher under 40 in Australia).
- Faculty of Science Citation for Excellence in Teaching, 2009.
- Grant (joint with A. Mathas), ‘Pyramids and decomposition numbers for the symmetric and general linear groups’, ARC Discovery–Projects, 2009–13.
- Grant, ‘The geometry of exotic nilpotent cones’, ARC D–P, 2009–10.
- Australian Postdoctoral Fellowship and grant, ‘Canonical bases for standard modules of affine Hecke algebras’, ARC D–P, 2003–06.

Research Publications (linked from my web page)

- [1] A. Henderson, ‘Fourier transform, parabolic induction, and nilpotent orbits’, *Transformation Groups* **6** (2001), 353–370.
- [2] A. Henderson, ‘Spherical functions of the symmetric space $G(\mathbb{F}_{q^2})/G(\mathbb{F}_q)$ ’, *Representation Theory* **5** (2001), 581–614.
- [3] A. Henderson, ‘Two-row nilpotent orbits of cyclic quivers’, *Mathematische Zeitschrift* **243** (2003), 127–143.
- [4] A. Henderson, ‘Symmetric subgroup invariants in irreducible representations of G^F , when $G = GL_n$ ’, *Journal of Algebra* **261** (2003), no. 1, 102–144.
- [5] A. Henderson, ‘Representations of wreath products on cohomology of De Concini–Procesi compactifications’, *International Mathematics Research Notices* **2004** (2004), no. 20, 983–1021.
- [6] A. Henderson, ‘Species over a finite field’, *Journal of Algebraic Combinatorics* **21** (2005), no. 2, 147–161.
- [7] A. Henderson, ‘Bases for certain cohomology representations of the symmetric group’, *J. Algebraic Combin.* **24** (2006), no. 4, 361–390.
- [8] A. Henderson, ‘Plethysm for wreath products and homology of sub-posets of Dowling lattices’, *Electronic Journal of Combinatorics* **13** (2006), no. 1, Research Paper 87, 25 pp.
- [9] A. Henderson, ‘Induced characters of the projective general linear group over a finite field’, *J. Algebra* **307** (2007), no. 1, 116–135.
- [10] A. Henderson, ‘Nilpotent orbits of linear and cyclic quivers and Kazhdan–Lusztig polynomials of type A’, *Represent. Theory* **11** (2007), 95–121.
- [11] A. Henderson and E. Rains, ‘The cohomology of real De Concini–Procesi models of Coxeter type’, *Int. Math. Res. Not.* **2008** (2008), no. 7, rnn001, 29pp.
- [12] A. Henderson, ‘The symmetric group representation on cohomology of the regular elements of a maximal torus of the special linear group’, *Journal of the Australian Mathematical Society* **84** (2008), no. 1, 85–98.
- [13] P. N. Achar and A. Henderson, ‘Orbit closures in the enhanced nilpotent cone’, *Advances in Mathematics* **219** (2008), no. 1, 27–62. Corrigendum: *Advances in Mathematics* **228** (2011), no. 5, 2984–2988.
- [14] A. Henderson and G. I. Lehrer, ‘The equivariant Euler characteristic of real Coxeter toric varieties’, *Bulletin of the London Mathematical Society* **41** (2009), no. 3, 515–523.
- [15] A. Henderson, ‘Exterior powers of the reflection representation in the cohomology of Springer fibres’, *Comptes Rendus Mathématique* **348** (2010), no. 19–20, 1055–1058.

- [16] P. N. Achar, A. Henderson, and E. Sommers, ‘Pieces of nilpotent cones for classical groups’, *Represent. Theory* **15** (2011), 584–616.
- [17] P. N. Achar, A. Henderson, and B. F. Jones, ‘Normality of orbit closures in the enhanced nilpotent cone’, *Nagoya Math. Journal* **203** (2011), 1–45.
- [18] A. Henderson and M. L. Wachs, ‘Unimodality of Eulerian quasisymmetric functions’, *Journal of Combinatorial Theory, Series A* **119** (2012), no. 1, 135–145.

Preprints (available from my web page and arXiv)

- A. Henderson, ‘Rational cohomology of the real Coxeter toric variety of type A’, to appear in Proceedings of the Centro De Giorgi, 10pp.
- P. N. Achar and A. Henderson, ‘Geometric Satake, Springer correspondence, and small representations’, 34pp.
- A. Henderson and P. E. Trapa, ‘The exotic Robinson–Schensted correspondence’, 14pp.

Expository Publications (linked from my web page)

- A. Henderson, ‘Enhancing the Jordan canonical form’, *Australian Mathematical Society Gazette* **38** (2011), no. 4, 206–211.
- A. Henderson, ‘Representations of Lie Algebras: An Introduction Through \mathfrak{gl}_n ’, to appear in *Australian Mathematical Society Lecture Notes*, Cambridge University Press, Cambridge.

Conference Presentations

- ‘Geometric Satake, Springer correspondence, and small representations’, AustMS Annual Meeting, Ballarat, Sep 12.
- ‘Geometric modular representation theory’, AMSI Workshop on Symmetry, Wollongong, Feb 12.
- ‘Small representations and the affine Grassmannian’, AustMS Annual Meeting, Wollongong, Sep 11.
- ‘The exotic Robinson–Schensted correspondence’, Workshop on Weyl Groups and Root Systems, Tokyo, Sep 11.
- ‘The affine Grassmannian and the nilpotent cone’, Conference on Algebraic Cycles and Orbit Spaces, Canberra, Sep 11.
- ‘The toric variety of the symmetric group’, Workshop on Combinatorial Representation Theory, Melbourne, Jan 11.

- ‘The toric variety of the symmetric group’, AustMS Annual Meeting, Brisbane, Sep 10.
- ‘Representations of reflection groups on the cohomology of varieties’, Workshop on Algebra and Geometry of Configuration Spaces, Pisa, Jun 10.
- ‘Pieces of nilpotent cones for classical groups’, Workshop on Combinatorial Representation Theory, Oberwolfach, Mar 10.
- ‘Pieces of nilpotent cones for classical groups’, AustMS Annual Meeting, Adelaide, Sep 09.
- ‘Orbit closures in nilpotent cones’, Australian/Japanese Workshop on Real and Complex Singularities, Sydney, Sep 09.
- ‘Enhancing the nilpotent cone’, Pacific Rim Math. Association Congress, Sydney, Jul 09.
- ‘Enhancing the nilpotent cone’, Australia/New Zealand Math. Convention, Christchurch, Dec 08.
- ‘Orbit closures in the enhanced nilpotent cone’, Conference on Shuffles, Descents, and Representations, Nice, Sep 07.
- ‘The cohomology of real De Concini–Procesi models of Coxeter type’, BIRS Workshop on Algebraic Lie Theory, Banff, May 07.
- ‘The cohomology of real De Concini–Procesi models of Coxeter type’, Conference on Braids and their Ramifications, Cortona, May 07.
- ‘The cohomology of the real De Concini–Procesi model of type B_n ’, AustMS Annual Meeting, Sydney, Sep 06.
- ‘Quiver varieties and zero weight spaces’, AMSI Workshop on Lie Theory, Newcastle, Nov 05.
- ‘Bases for certain cohomologies with local coefficients of a hyperplane complement’, AustMS Annual Meeting, Perth, Sep 05.
- ‘Nilpotent orbits of linear and cyclic quivers and Kazhdan-Lusztig polynomials of type A’, Math. Physics and Lie Theory, Coolangatta, Dec 04.
- ‘The symmetric group representation on cohomology of the regular elements of a maximal torus’, AustMS Annual Meeting, Melbourne, Sep 04.
- ‘Representations of wreath products on cohomology of De Concini–Procesi compactifications’, Lie Minisymposium, Sydney, Nov 03.
- ‘Species over a finite field’, Aus/NZ Math. Convention, Sydney, Jul 03.
- ‘Representations of wreath products on cohomology of De Concini–Procesi compactifications’, Workshop on Representation Theory, Canberra, Jul 03.

- ‘Two-row nilpotent orbits of cyclic quivers’, Australasian Research Symposium on Groups and Representations, Auckland, Dec 01.
- ‘ $K(\mathbb{F}_q)$ -invariants in irreducible representations of $G(\mathbb{F}_q)$, when $G = GL_n$ ’, AustMS Annual Meeting, Canberra, Sep 01.

Seminars and Colloquia

- University of Adelaide Geometry Seminar, Jun 12.
- ‘Enhancing the Jordan canonical form’, University of Adelaide Mathematics Colloquium, Jun 12.
- ‘Enhancing the Jordan canonical form’, University of Queensland Mathematics Colloquium, May 11.
- ‘Exotic nilpotent cones and Springer representations of Weyl groups’, Séminaire Chevalley, Paris, Jun 10.
- ‘Orbit closures in nilpotent cones’, Université de Caen Alg Sem, Jun 10.
- ‘Pieces of nilpotent cones for classical groups’, London Algebra Colloquium, Mar 10.
- ‘Pieces of nilpotent cones for classical groups’, University of Utah Representation Theory Seminar, Nov 09.
- ‘Enhancing the Jordan canonical form’, University of Utah Mathematics Colloquium, Nov 09.
- ‘Orbit closures in nilpotent cones’, University of Iowa Alg Sem, Nov 09.
- ‘Enhancing the nilpotent cone’, University of North Carolina Representation Theory Seminar, Nov 09.
- ‘Enhancing the nilpotent cone’, Louisiana State U Alg Sem, Oct 09.
- ‘Pieces of nilpotent cones for classical groups’, ANU Alg Sem, Aug 09.
- ‘Geometry of the exotic nilpotent cone’, Algebraic Lie Theory Seminar, Isaac Newton Institute, Cambridge, Jun 09.
- ‘Orbit closures in the enhanced nilpotent cone’, ANU Alg Sem, Nov 07.
- ‘Poset homology and the cohomology of real De Concini-Procesi models’, UNSW Pure Maths Sem, Aug 06.
- ‘Quiver varieties and zero weight spaces’, ANU Alg Sem, Nov 05.
- ‘Analytic functors and representations of wreath products’, ANU Maths Colloquium, Oct 05.

- ‘Polynomial functors and representations of wreath products’, UNSW Pure Maths Sem, Aug 05.
- ‘Introduction to perverse sheaves’, UNSW Alg Sem, May 03.
- ‘Green functions for symmetric spaces’, ANU Alg Sem, Sep 02.
- ‘Spherical functions of the symmetric space $GL_n(\mathbb{F}_{q^2})/GL_n(\mathbb{F}_q)$ ’, MIT Lie Groups Sem, Nov 00.
- Many at University of Sydney, including 16 in USyd Alg Sem.

Teaching (at USyd unless stated)

- Lecturer, MATH1901 ‘Differential Calculus (Advanced)’, 2007–08.
- Lecturer, MATH1906 ‘Special Studies Program’, 2005–06,08–10.
- Lecturer, MATH20(9)69 ‘Discrete Maths & Graph Theory’, 2007–09.
- Lecturer, MATH2916 ‘Special Studies Program’, 2011.
- Lecturer, MATH2968 ‘Algebra (Advanced)’, 2011.
- Lecturer, MATH3002 ‘Rings and Fields’, 2003–04.
- Lecturer, MATH3966 ‘Modules & Group Representations’, 2006–10.
- Lecturer, Honours ‘Lie Algebras’, 2002, 2005, 2011, and at AMSI Summer School, 2004 (UNSW) and 2007 (USyd).
- Tutor, various undergraduate classes, 2003 – present.

Postgraduate Supervision

- Natalie Aisbett, PhD, supervisor, Jul 11 – present.
- Andrew Crisp, PhD, supervisor, Mar 09 – present.
- Michael Sun, MSc, supervisor, Feb 09 – Jan 10.
- Graham White, MSc, associate supervisor, Feb 12 – present.
- Clinton Boys, PhD, associate supervisor, Feb 11 – present.
- Ge Li, PhD, associate supervisor, Mar 09 – present.
- Justin Koonin, PhD, associate supervisor, Jul 07 – Mar 12.
- Neil Saunders, PhD, associate supervisor, Apr 07 – Feb 11.

Honours Supervision

- Noah White, 2011 (First Class Honours).
- Clinton Boys, 2010 (First Class Honours).

- Vinoth Nandakumar, 2010 (First Class Honours and University Medal).
- Michael Sun, 2008 (First Class Honours and University Medal).
- Fan Wu, 2008 (First Class Honours).
- Alex Fun, 2007 (First Class Honours).

I have also supervised eight summer vacation scholars.

Mathematical Service

- Early/Mid-Career Researcher Observer, National Committee for the Mathematical Sciences, Australian Academy of Science, 2012 – present.
- Council Member, Australian Mathematical Society, 2009–11.
- Member of prize committee for AustMS Gavin Brown Prize, 2011.
- Organizer, SUMS Problem Competition, 2006 – present.
- Organizer of AustMS Early Career Workshop, September 2009 and 2010.
- Organizer of conference ‘GL07: Geometry and Lie Theory’, ANU and USyd, July 2007.
- Member of local committee for conference ‘Geometric Aspects of Representation Theory’, USyd, July 2002.
- Referee for *Advances in Mathematics*, *Duke Mathematical Journal*, *Journal of Combinatorial Theory Series A*, *Journal of Algebra*, *Representation Theory*, *Transformation Groups*, *Mathematical Research Letters*, *Journal of the Australian Mathematical Society*, *Bulletin of the Australian Mathematical Society*, *Australasian Journal of Combinatorics*.
- Reviewer, *Mathematical Reviews*.
- Organizer, USyd Algebra Seminar, July 2003 – December 2008.
- Mentor of Australian IMO team members, 2002 and 2004.
- Lecturer, Australian IMO training schools, 1995–97.