

# Prof Anthony Henderson FAustMS Curriculum Vitae

School of Mathematics and Statistics F07  
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## Employment History

- Jan 2016 – present: Professor of Mathematics, University of Sydney.
- Jan 2012 – Dec 2015: Associate Professor, University of Sydney.  
[Jul–Dec '12, Jan–Apr '14, Jul–Sep '15: Visiting Fellow, Australian National University]
- Jan 2009 – Dec 2011: Senior Lecturer, University of Sydney.  
[Jan–Jun '10: Senior Research Associate, University of Sydney]
- Jan 2007 – Dec 2008: Lecturer, University of Sydney.
- Jul 2001 – Dec 2006: Postdoctoral Research Fellow, University of Sydney.

## Degrees Attained

- PhD in Mathematics, MIT, 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

- Discovery Projects grant (joint with P. N. Achar), Australian Research Council, 2017–19.
- Discovery Projects grant (joint with G. I. Lehrer and G. Williamson), ARC, 2016–20.
- Australian Mathematical Society Medal, 2012 (joint winner - for distinguished research by a member under 40), and Fellowship of the Society.
- Future Fellowship, ARC, 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.
- Discovery Projects grant (joint with A. Mathas), ARC, 2009–13.
- Discovery Projects grant, ARC, 2009–10.
- Postdoctoral Fellowship and Discovery Projects grant, ARC, 2003–06.

## Research Preprints (available from my web page and arXiv)

- A. Henderson, ‘Involutions on the affine Grassmannian and moduli spaces of principal bundles’, *Bulletin of the Institute of Mathematics, Academia Sinica*, in press.
- P. N. Achar, A. Henderson, D. Juteau and S. Riche, ‘Modular generalized Springer correspondence: an overview’, *Adv. Lect. Math.*, in press.

## Research Publications (linked from my web page)

- [30] P. N. Achar, A. Henderson, D. Juteau and S. Riche, ‘Modular generalized Springer correspondence III: exceptional groups’, *Mathematische Annalen* **369** (2017), no. 1–2, 247–300.
- [29] P. N. Achar, A. Henderson, D. Juteau and S. Riche, ‘Modular generalized Springer correspondence II: classical groups’, *Journal of the European Mathematical Society (JEMS)* **19** (2017), no. 4, 1013–1070.
- [28] P. N. Achar, A. Henderson, D. Juteau and S. Riche, ‘Constructible sheaves on nilpotent cones in rather good characteristic’, *Selecta Mathematica* **23** (2017), no. 1, 203–243.
- [27] P. N. Achar, A. Henderson, D. Juteau and S. Riche, ‘Modular generalized Springer correspondence I: the general linear group’, *Journal of the European Mathematical Society (JEMS)* **18** (2016), no. 7, 1405–1436.
- [26] A. Henderson, ‘Singularities of nilpotent orbit closures’, *Revue Roumaine de Mathématiques Pures et Appliquées* **60** (2015), no. 4, 441–469.
- [25] P. N. Achar, A. Henderson and S. Riche, ‘Geometric Satake, Springer correspondence, and small representations II’, *Rep. Theory* **19** (2015), 94–166.
- [24] A. Henderson and A. Licata, ‘Diagram automorphisms of quiver varieties’, *Advances in Mathematics* **267** (2014), 225–276.
- [23] P. N. Achar, A. Henderson, D. Juteau and S. Riche, ‘Weyl group actions on the Springer sheaf’, *Proc. London Math. Soc.* **108** (2014), no. 6, 1501–1528.
- [22] P. N. Achar and A. Henderson, ‘Geometric Satake, Springer correspondence, and small representations’, *Selecta Mathematica* **19** (2013), no. 4, 949–986.
- [21] A. Henderson, ‘Rational cohomology of the real Coxeter toric variety of type A’, in ‘Configuration Spaces: Geometry, Combinatorics, and Topology’, *Publications of the Scuola Normale Superiore*, no. 14, A. Björner, F. Cohen, C. De Concini, C. Procesi and M. Salvetti (eds.), Pisa, 2012, 313–326.
- [20] A. Henderson and P. E. Trapa, ‘The exotic Robinson–Schensted correspondence’, *Journal of Algebra* **370** (2012), 32–45.
- [19] A. Henderson and M. L. Wachs, ‘Unimodality of Eulerian quasisymmetric functions’, *Journal of Combinatorial Theory A* **119** (2012), no. 1, 135–145.

- [18] A. Henderson, ‘Enhancing the Jordan canonical form’, *Australian Mathematical Society Gazette* **38** (2011), no. 4, 206–211.
- [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.
- [16] P. N. Achar, A. Henderson and E. Sommers, ‘Pieces of nilpotent cones for classical groups’, *Rep. Theory* **15** (2011), 584–616.
- [15] A. Henderson, ‘Exterior powers of the reflection representation in the cohomology of Springer fibres’, *C. R. Math.* **348** (2010), no. 19–20, 1055–1058.
- [14] A. Henderson and G. I. Lehrer, ‘The equivariant Euler characteristic of real Coxeter toric varieties’, *Bull. London Math. Soc.* **41** (2009), no. 3, 515–523.
- [13] P. N. Achar and A. Henderson, ‘Orbit closures in the enhanced nilpotent cone’, *Advances in Mathematics* **219** (2008), no. 1, 27–62.
- [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.
- [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.
- [10] A. Henderson, ‘Nilpotent orbits of linear and cyclic quivers and Kazhdan-Lusztig polynomials of type A’, *Rep. Theory* **11** (2007), 95–121.
- [9] A. Henderson, ‘Induced characters of the projective general linear group over a finite field’, *Journal of Algebra* **307** (2007), no. 1, 116–135.
- [8] A. Henderson, ‘Plethysm for wreath products and homology of sub-posets of Dowling lattices’, *Electronic J. of Combinatorics* **13** (2006), no. 1, 25 pp.
- [7] A. Henderson, ‘Bases for certain cohomology representations of the symmetric group’, *Journal of Algebraic Combinatorics* **24** (2006), no. 4, 361–390.
- [6] A. Henderson, ‘Species over a finite field’, *Journal of Algebraic Combinatorics* **21** (2005), no. 2, 147–161.
- [5] A. Henderson, ‘Representations of wreath products on the cohomology of De Concini–Procesi compactifications’, *Int. Math. Res. Not.* **2004** (2004), no. 20, 983–1021.
- [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.
- [3] A. Henderson, ‘Two-row nilpotent orbits of cyclic quivers’, *Mathematische Zeitschrift* **243** (2003), 127–143.
- [2] A. Henderson, ‘Spherical functions of the symmetric space  $G(\mathbb{F}_{q^2})/G(\mathbb{F}_q)$ ’, *Rep. Theory* **5** (2001), 581–614.
- [1] A. Henderson, ‘Fourier transform, parabolic induction, and nilpotent orbits’, *Transformation Groups* **6** (2001), 353–370.

## Invited Conference Presentations

- ‘Involutions on the affine Grassmannian and moduli spaces of principal bundles’, Workshop on Algebraic Groups, Oberwolfach, Apr 17.
- ‘Involutions on the affine Grassmannian and moduli spaces of principal bundles’, Conference on Nilpotent Orbits, Pisa, Jun 16.
- ‘Modular generalized Springer correspondence’, 5th Taipei Conference in Representation Theory, Taipei, Jan 16.
- ‘Modular generalized Springer correspondence’, Conference on Geometric and Categorical Representation Theory, Mooloolaba, Dec 15.
- ‘Towards a theory of modular character sheaves’, Workshop on Geometric Quantization, Adelaide, Jul 15.
- ‘Geometric Satake, Springer correspondence, and small representations’, Workshop on Representation Theory, Oberwolfach, May 15.
- **Mini-course**, ‘Character sheaves and modular generalized Springer correspondence’, Winter School on Representation Theory, Research Institute for the Mathematical Sciences, Kyoto, Jan 15.
- ‘The modular generalized Springer correspondence’, Workshop on Algebraic Groups and Representations, Tsinghua Sanya Int’l Math. Forum, Dec 14.
- ‘Character sheaves’, Workshop on Algebra and Topology, ANU Kioloa Campus, Nov 14.
- ‘The modular generalized Springer correspondence’, Conference on Algebraic Groups and Representations, Lyon, Jul 14.
- ‘Diagram automorphisms of quiver varieties’, Conference on Representation Theory in Geometry, Topology and Combinatorics, Melbourne, Nov 13.
- **Plenary lecture**, ‘A partial history of the Schur functor’, Australian Mathematical Society Annual Meeting, Sydney, Sep 13.
- **Mini-course**, ‘Singularities arising from nilpotent orbits’, Japanese–Aust. Workshop on Real and Complex Singularities, Sydney, Sep 13.
- ‘The modular generalized Springer correspondence’, Pacific Rim Math. Association Congress, Shanghai, Jun 13.
- ‘The modular generalized Springer correspondence’, Workshop on Algebraic Geometry and Related Fields, Canberra, May 13.
- ‘Quiver varieties of type D’, Workshop on Algebraic Groups, Oberwolfach, Apr 13.
- ‘Quiver varieties of type D’, Workshop on Geometry of Nilpotent Orbits and Finite  $W$ -algebras, Poitiers, Apr 13.

- ‘The affine Grassmannian, the nilpotent cone, and quiver varieties’, Workshop on Algebra, Caen, Mar 13.
- ‘Geometric Satake, Springer correspondence, and small representations’, Conference on Algebraic Groups and Rep Thy, Hong Kong, Jan 13.
- ‘Geometric modular representation theory’, AMSI Workshop on Symmetry, Wollongong, Feb 12.
- ‘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.
- ‘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.
- ‘Orbit closures in nilpotent cones’, Japanese–Australian Workshop on Real and Complex Singularities, Sydney, Sep 09.
- ‘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.
- ‘Quiver varieties and zero weight spaces’, AMSI Workshop on Lie Theory, Newcastle, Nov 05.
- ‘Nilpotent orbits of linear and cyclic quivers and Kazhdan–Lusztig polynomials of type A’, Math. Physics and Lie Theory, Coolangatta, Dec 04.
- ‘Representations of wreath products on cohomology of De Concini–Procesi compactifications’, Lie Minisymposium, Sydney, Nov 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.

## Seminars and Colloquia (not at USyd)

- Australian National University Algebra Seminar, Sep 17, Mar 14, Aug 12, Jul 12, Aug 09, Nov 07, Nov 05, Sep 02; Mathematics Colloquium, Oct 05.
- University of Melbourne Algebra/Geometry/Topology Seminar, Sep 17, Jul 13.
- Macquarie University Category Theory Seminar, Sep 17.
- **Seminar Series**, POSTECH Center for Geometry, Pohang, Jan–Feb 15.
- University of Kyoto Representation Theory Seminar, Jan 15.
- University of Western Sydney Mathematics Colloquium, Aug 13.
- Universität Bonn Representation Theory Seminar, Apr 13.
- Université de Clermont–Ferrand II Colloquium, Apr 13.
- University of Adelaide Geometry Seminar and Colloquium, Jun 12.
- University of Queensland Mathematics Colloquium, May 11.
- Séminaire Chevalley, Paris, Jun 10.
- Université de Caen Algebra Seminar, Jun 10.
- London Algebra Colloquium, Mar 10.
- University of Utah Representation Theory Seminar and Colloquium, Nov 09.
- University of Iowa Algebra Seminar, Nov 09.
- University of North Carolina Representation Theory Seminar, Nov 09.
- Louisiana State University Algebra Seminar, Oct 09.
- Algebraic Lie Theory Seminar, Isaac Newton Institute, Cambridge, Jun 09.
- University of New South Wales Pure Maths Seminar, Aug 06, Aug 05.
- **Seminar Series**, UNSW Algebra Seminar, May 03.
- Massachusetts Institute of Technology Lie Groups Sem, Nov 00.

## Postdoctoral Supervision

- Ulrich Thiel, Research Fellow (ARC-supported), Apr 17 – present.
- Alan Stapledon, USyd Postdoctoral Fellow, Jul 13 – Mar 15.

## Postgraduate Supervision

- Joel Gibson, PhD, auxiliary supervisor, current.
- Alexander Kersch, PhD, auxiliary supervisor, current.
- Michael Hendriksen, MSc, associate supervisor, approved Jan 16.

- Clinton Boys, PhD, associate supervisor, approved Feb 15.
- Natalie Aisbett, PhD, primary supervisor, approved Jun 13.
- Graham White, MSc, associate supervisor, approved May 13.
- Ge Li, PhD, associate supervisor, approved Dec 12.
- Justin Koonin, PhD, associate supervisor, approved Mar 12.
- Neil Saunders, PhD, associate supervisor, approved Feb 11.
- Michael Sun, MSc, primary supervisor, approved Jan 10.

## Honours Supervision

- Edwin Spark, 2016 (First Class Honours and University Medal).
- Kane Townsend, 2016 (First Class Honours).
- Christopher Ryba, 2014 (First Class Honours and University Medal).
- 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).

## Undergraduate Textbook

- A. Henderson, ‘Representations of Lie Algebras: An Introduction Through  $\mathfrak{gl}_n$ ’, *Australian Mathematical Society Lecture Series*, no. 22, Cambridge University Press, Cambridge, 2012.

## Courses Lectured (at USyd unless specified)

- First year: Differential Calculus (Advanced), 2007–08; Linear Algebra, 2016.
- Second year: Discrete Mathematics and Graph Theory, 2007–09; Algebra (Advanced), 2011, 2017; Number Theory and Cryptography, 2016; Special Studies Program, 2011, 2013.
- Third year: Rings and Fields, 2003–04; Modules and Group Representations (Advanced), 2006–10.
- Honours: Lie Algebras, 2002, 2005, 2011, 2014, and also in the Australian Mathematical Sciences Institute Summer School, 2004 and 2007; Representation Theory, 2016–17.
- Postgraduate: Geometric Representation Theory, AMSI Winter School, 2015.

## Mathematical Service

- Member of Research and Higher Education committee, Australian Mathematical Sciences Institute, 2016–2018.
- Director, AMSI Summer School 2017.
- Member of prize committee, Australian Mathematical Society Medal, 2017.
- Elected Vice-President, Australian Mathematical Society, 2013–15.
- Member of steering committee, Decadal Plan for the Mathematical Sciences in Australia, 2012–15.
- Early/Mid-Career Researcher Observer, National Committee for the Mathematical Sciences, Australian Academy of Science, 2012–13.
- Member of Council, AustMS, 2009–11.
- Member of prize committee, AustMS Gavin Brown Prize, 2011.
- Director, Simon Marais Mathematics Competition Ltd, 2016 – present.
- Organizer, Sydney University Mathematics Society Problem Competition, 2006–15.
- Chair of organizing committee, ‘Future Directions in Representation Theory’ conference, USyd, Dec 2017.
- Organizer, Representation Theory Special Session, AustMS Annual Meeting, 2014–15.
- Organizer, AustMS Early Career Workshop, 2009–10.
- Organizer, ‘Geometry and Lie Theory’ conference, ANU/USyd, July 2007.
- Member of local committee, ‘Geometric Aspects of Representation Theory’ conference, USyd, July 2002.
- Organizer, USyd Algebra Seminar, 2003–08.
- Associate Editor, *Journal of the Australian Math. Soc.*, 2012 – present.
- Referee for *Advances in Mathematics*, *Duke Mathematical J.*, *American J. of Mathematics*, *J. of Combinatorial Theory Series A*, *J. of Algebra*, *Representation Theory*, *Transformation Groups*, *J. of Lie Theory*, *Selecta Mathematica*, *International Mathematical Research Notices*, *Mathematische Zeitschrift*, *Mathematical Research Letters*, *Pacific J. of Mathematics*, *Electronic J. of Combinatorics*, *Mathematics of Computation*, *J. of the European Math. Soc.*, *J. of the London Math. Soc.*, *Bull. of the London Math. Soc.*, *J. of the Math. Soc. of Japan*, *Bull. of the Iranian Math. Soc.*, *J. of the Australian Math. Soc.*, *Bull. of the Australian Math. Soc.*, *Australasian J. of Combinatorics*, proceedings.
- Reviewer, *Mathematical Reviews*.