Curriculum Vitae for Dr. Mark Grant

CONTACT DETAILS

Institute of Mathematics   Tel: +44 (0)1224 27 3391
Fraser Noble Building   Fax: +44 (0)1224 27 2607
University of Aberdeen   mark.grant@abdn.ac.uk
Aberdeen AB24 3UE   homepages.abdn.ac.uk/mark.grant/pages/
Scotland

EDUCATION

University of Manchester, UK	Sep 2002 to Dec 2005
✳ **Ph. D** – supervised by Prof. Peter J Eccles	Graduated May 2006
Thesis title – 'Bordism of Immersions'	
✳ **University of Edinburgh, UK**	Oct 1998 to May 2002
MA Mathematics – First Class Honours	Graduated Jul 2002

POSITIONS HELD

✳ **University of Aberdeen, UK**	Sep 2014 to present
Lecturer of Pure and Applied Mathematics	
✳ **Newcastle University, UK**	Sep 2013 to Aug 2014
Lecturer	
✳ **University of Nottingham, UK**	Sep 2011 to Jun 2013
Lecturer	
✳ **University of Edinburgh, UK**	Sep 2008 to Aug 2011
Lecturer	
✳ **Durham University, UK**	Jan 2006 to Sep 2008
Research Associate	

RESEARCH INTERESTS

✳ **Topological Robotics** – applications of topology to the motion planning problem, topological complexity

✳ **Algebraic Topology** – numerical homotopy invariants, rational homotopy theory

✳ **Differential Topology** – immersions and their self-intersections, cobordism theory, connections with homotopy theory

✳ **Cohomology of groups** – finiteness properties of torsion-free groups

PUBLICATIONS

1. *Symmetrized topological complexity*, submitted. `arXiv:1703.07142`

2. *Hopf Invariants for sectional category with applications to topological robotics* (with J. González and L. Vandembroucq), submitted. `arXiv:1405.6891`

3. *Hopf invariants, topological complexity, and LS-category of the cofiber of the diagonal map for two-cell complexes* (with J. González and L. Vandembroucq), to appear in Contemp. Math. `arXiv:1607.08858`

4. *Topological complexity of subgroups of Artin's braid groups* (with D. Recio-Mitter), to appear in Contemp. Math. `arXiv:1607.04830`

5. *Realizing homology classes up to cobordism* (with A. Szűcs and T. Terpai), to appear in Osaka J. Math. `arXiv:1602.05759`

6. *The Poincaré–Hopf Theorem for line fields revisited* (with Diarmuid Crowley), J. Geom. Phys. **117** (2017), 187–196.

7. *A mapping theorem for topological complexity* (with G. Lupton and J. Oprea), Algebr. Geom. Topol. **15** (2015), 1643–1666.

8. *Sequential motion planning of non-colliding particles in Euclidean spaces* (with J. González), Proc. Amer. Math. Soc. **143** (2015), 4503–4512.

9. *New lower bounds for the topological complexity of aspherical spaces* (with G. Lupton and J. Oprea), Topology Appl. **189** (2015), 78–91.

10. *Homologies are infinitely complex* (with A. Szűcs), Topol. Methods Nonlinear Anal. **45** (2015), no. 1, 55–61.

11. *Spaces of topological complexity one* (with G. Lupton and J. Oprea), Homology Homotopy Appl. **15** (2013), no. 2, 73–81.

12. *On realizing homology classes by maps of restricted complexity* (with A. Szűcs), Bull. Lond. Math. Soc. **45** (2013), no. 2, 329–340.

13. *Topological complexity of motion planning in projective product spaces* (with J. González, E. Torres-Giese and M. Xicoténcatl), Algebr. Geom. Topol. **13** (2013), no. 2, 1027–1047.

14. *On self-intersection invariants*, Glasgow Math. J. **55** (2013), no. 2, 259–273.

15. *Equivariant topological complexity* (with H. Colman), Algebr. Geom. Topol. **12** (2012), no. 4, 2299–2316.

16. *Self-intersections of Immersions and Steenrod Operations* (with P. J. Eccles), Acta Math. Hungar. **137** (2012), no. 4, 272–281.

17. *Topological complexity, fibrations and symmetry*, Topology Appl. **159** (2012), no. 1, 88–97.

18. *Topological complexity of configuration spaces* (with M. Farber), Proc. Amer. Math. Soc. **137** (2009), no. 5, 1841–1847.

19. *Topological complexity of motion planning and Massey products*, In "Algebraic Topology—Old and New: M. M. Postnikov Memorial Conference" M. Golasiński et al (eds), Banach Center Publ. **85** (2009), 193–203.

20. *Robot motion planning, weights of cohomology classes, and cohomology operations* (with M. Farber), Proc. Amer. Math. Soc. **136** (2008), no. 9, 3339–3349.

21. *Symmetric Motion Planning* (with M. Farber), In "Topology and Robotics", M. Burger, M. Farber, R. Ghrist and D. Koditschek (eds), Contemp. Math. **438** (2007), 85–104.

22. *Topological complexity of collision free motion planning algorithms in the presence of multiple moving obstacles* (with M. Farber and S. Yuzvinsky), In "Topology and Robotics", M. Burger, M. Farber, R. Ghrist and D. Koditschek (eds), Contemp. Math. **438** (2007), 75–83.

23. *Bordism Groups of Immersions and Classes Represented by Self-intersections,* (with P. J. Eccles), Algebr. Geom. Topol. **7** (2007), 1081–1097.

24. *Bordism classes represented by multiple point manifolds of immersed manifolds,* (with P. J. Eccles), Proc. Steklov Inst. Math. **252** (2006), no. 1, 47–52.

UNDERGRADUATE TEACHING

* **(Lecturer at University of Aberdeen, 2014 to present)** 'Algebra' (Level 1), 'Mathematical Foundations of Everyday Life' (Level 3), 'Project' (Level 4), 'Metric and Topological Spaces' (Level 3)

* **(Lecturer at Newcastle University, 2013 to 2014)** 'Survey Mathematics' (Level 2 service), 'Group Project Module' (Level 3), 'The Foundations of Calculus' (Level 2)

* **(Lecturer at University of Nottingham, 2011 to 2013)** 'Analytical and Computational Foundations' (Level 1), 'Metric and Topological Spaces' (Level 3)

* **(Lecturer at University of Edinburgh, 2008 to 2011)** 'Applicable Mathematics 1' and 'Applicable Mathematics 2' (Level 1 service), 'Numbers and Rings' (Level 3), 'Individual Project' (Level 4)

POSTGRADUATE TEACHING

* **(Lecturer at University of Nottingham, 2011 to 2013)** 'Foundations of Advanced Analysis' (MMath course)

* **Ph. D student:** David Recio-Mitter (University of Aberdeen, Sep 2015 to present)

* Dec 2014 – External examiner for Ph. D thesis of A. Longdon, 'Stably complex structures on self-intersection manifolds of immersions', University of Manchester

* May 2011 – Internal examiner for Ph. D thesis of J. Collins, 'On the concordance orders of knots', University of Edinburgh

Administration

* Jun 2016 to present – Organizer of Topology Seminar at University of Aberdeen

* Sep 2014 to present – Personal Tutor at University of Aberdeen

* Sep 2014 to Jun 2016 – Recruitment Officer for the Department of Mathematics at University of Aberdeen (coordinator of undergraduate Applicant Days and Open Days, and student visits)

Conference organization and other service

* Apr 2017 to present – Editor of *Proceedings of the Royal Society of Edinburgh Section A: Mathematics*

* Dec 2016 to present – Co-organizer of the Scottish Topology Seminar (supported by the Glasgow Mathematical Journal Trust)

* Feb 2016 – Co-organizer of MF Oberwolfach mini-workshop on 'Topological complexity and related topics' (with G. Lupton and L. Vandembroucq)

* Jan 2015 to present – Co-organizer of UK research network in Applied Algebraic Topology (with J. Brodzki, M. Farber, J. Grbić, V. Kurlin and D. Schütz)

* Mar 2012 – Organizer of the 83$^{\mathrm{rd}}$ meeting of the Transpennine Topology Triangle, held at the University of Nottingham (supported by the LMS)

* Dec 2007 – Co-organizer of 'Prospects in Mathematics', a conference for potential graduate students held at Durham University Durham University

* **Refereeing work** – Geom. Dedicata, J. Lond. Math. Soc., Proc. Amer. Math. Soc., Commun. Contemp. Math., Math. Proc. Cambridge Philos. Soc., Algebr. Geom. Topol., Topology Appl., Topol. Methods Nonlinear Anal., Bol. Soc. Mat. Mexicana, Contemp. Math., Banach Center Publ., J. Mechanisms Robotics, Publ. Mat., J. Topol. Anal., Forum Math., J. Applied and Computational Topology.

Grants

* Nov 2015 – Awarded London Mathematical Society Scheme 3 grant (£2000) and grants from the Glasgow Mathematical Journal Trust Fund (£1135) and Institute of Mathematics and its Applications (£600) to continue Applied Algebraic Topology research network into second year (with J. Brodzki, M. Farber, J. Grbić, V. Kurlin and D. Schütz)

* Sep 2014 – Awarded London Mathematical Society Scheme 3 grant (£2000) and Edinburgh Mathematical Society Research Support Fund (£1200) to establish UK research network in Applied Algebraic Topology (with J. Brodzki, M. Farber, J. Grbić, V. Kurlin and D. Schütz)

* Apr 2013 – Awarded Institute of Mathematics and its Applications small grant (£300) to attend Applied Topology conference in Będlewo, Poland in July 2013

* May 2010 – Awarded Royal Society International Travel Grant (£2300) to visit Prof. Aniceto Murillo at the University of Málaga

SELECTED ACADEMIC TALKS

* Oct 2016 – Amiens, France – Colloque 2016 du GDR 2875, Topologie Algébrique et Applications – "Topological complexity of configuration spaces" (invited talk)

* Sep 2016 – Durham University, UK – Applied Algebraic Topology 7 – "The Poincaré–Hopf Theorem for line fields (revisited)" (invited talk)

* Aug 2016 – Saas-Almagell, Switzerland – Alpine Algebraic and Applied Topology Conference – "The Poincaré–Hopf Theorem for line fields (revisited)"

* Apr 2016 – British Applied Mathematics Colloquium, Oxford, UK – "A survey of Farber's topological complexity" (invited talk)

* Apr 2015 – Faculté des Sciences Ain Chock, Casablanca, Morocco – Moroccan Area of Algebraic Topology seminar – "Computations of topological complexity" (invited talk)

* Apr 2015 – Université Internationale de Casablance, Morocco – Colloque MASSIF 2 – "Topology and robot motion planning" (invited talk)

* Feb 2015 – Durham University, UK – Pure Mathematics Colloquium – "Lower bounds for the topological complexity of groups" (invited talk)

* Feb 2015 – IST, Lisbon, Portugal – XXI Oporto meeting on Geometry, Topology and Physics – "Hopf invariants for sectional category with applications to Topological Robotics" (invited talk)

* Jul 2014 – CIEM, University of Cantabria, Spain – Applied Algebraic Topology workshop – "A mapping theorem for topological complexity" (invited talk)

* Jul 2013 – Stefan Banach International Mathematical Center, Będlewo, Poland – Applied Topology conference – "Topological complexity of braid groups" (invited talk)

* Mar 2013 – Cleveland State University, USA – Topology seminar – "Equivariant topological complexity" (invited talk)

* Mar 2012 – Cleveland State University, USA – Mathematics Colloquium – "Topology and Robotics" (invited talk)

* Dec 2011 – University of Leicester, UK – Transpennine Topology Triangle – "Realizing homology classes by immersions" (invited talk)

* Sep 2011 – ICMS, Edinburgh, UK – British Topology Meeting – "On immersions in homology classes"

* Mar 2011 – Edinburgh University, UK – Informatics seminar – "Topological complexity of motion planning algorithms" (invited talk)

* Nov 2010 – Edinburgh University, UK – School Colloquium – "Topology and Robotics" (invited talk)

* Oct 2010 – Oberwolfach, Germany – Arbeitsgemeinschaft 'Topological Robotics' – "Topological Complexity and the Immersion Problem"

* Aug 2007 – Oberwolfach, Germany – mini-workshop 'Topology of closed 1-forms and cohomology jumping loci' – "Topological complexity and cohomology operations" (invited talk)

* Jun 2007 – Stefan Banach International Mathematical Center, Będlewo, Poland – M. M. Postnikov Memorial Conference – "Sectional category weight and topological complexity"

* Apr 2007 – Swansea University, UK – British Mathematical Colloquium – "Sectional category weight and topological complexity"

* Aug 2006 – University of Manchester, UK – Transpennine Topology Triangle – "Topological Complexity of Robot Motion Planning" (invited talk)

* Jul 2006 – ETH, Zürich, Switzerland – Workshop on Topology and Robotics – "Symmetric Motion Planning" (invited talk)

* Jul 2005 – University of Siegen, Germany – 5th International Siegen Topology Symposium – "Self-intersections of Immersions and Steenrod Operations"

OUTREACH

* Jun 2016 – Delivered a talk "Euler on Tour" at the awards day of the Scottish Mathematical Challenge at the University of Aberdeen

* Mar 2016 – Coordinated activity "Euler on Tour" for groups of primary school students at Fraserburgh Science Fair, North East Scotland College

* Feb 2016 – Coordinated activity "Convex Polyhedra and Euler's Formula" for secondary school students visiting the University of Aberdeen for Experience Science (Mathematics)

* Jun 2015 – Delivered a talk and workshop "Spherical Geometry and Euler's Formula" at the awards day of the Scottish Mathematical Challenge at the University of Aberdeen

* Sep 2007 – Delivered a public lecture "Turning Spheres Inside-out" to alumni of Durham University

* Jun 2005 – Delivered two 50 minute talks to students at Kings of Wessex Upper School, Somerset, UK with the aim of promoting further education in mathematics