

CURRICULUM VITAE
MARC LACKENBY
MAY 2012

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DATE OF BIRTH: 28 August 1972

PRINCIPAL RESEARCH INTERESTS

Topology, geometry & group theory, particularly in dimension three.

MAJOR AWARDS

- London Mathematical Society Whitehead Prize (2003)
- EPSRC Advanced Fellowship (2004 - 09)
- Philip Leverhulme Prize (2006)
- Invited Speaker, ICM 2010 (topology section)

PROFESSIONAL EXPERIENCE

- 2006 - present, Professor, Oxford University and Tutorial Fellow, St. Catherine's College, Oxford
- 1999 - 2006, University Lecturer, Oxford University and Tutorial Fellow, St. Catherine's College, Oxford
- 1996 - 99, Research Fellow, Trinity College, Cambridge (on leave 1997 - 98)
- 1997 - 98, Miller Research Fellow, UC Berkeley

EDUCATION

- 1994 - 97, PhD, Cambridge (supervisor W.B.R. Lickorish)
- 1990 - 94, Cambridge Mathematics Tripos, Parts I, II and III

SERVICES TO THE MATHEMATICAL COMMUNITY

- I am an Editor of three journals:
 - *The Journal of Topology*,
 - *The Journal of the London Mathematical Society*,
 - *Groups, Geometry and Dynamics*.

- I am a member of the Research Policy Committee of the London Mathematical Society.
- I am a member of the Royal Society's Research Appointment Panel.
- I sat on the selection panel for EPSRC Advanced Research Fellows in 2004.
- I ran the graduate Taught Course Centre, based at Oxford, Warwick, Imperial, Bath and Bristol, in the set-up phase from March 2006 to March 2007.
- I organised a workshop in Oxford on the Geometry & Topology of 3-Manifolds in 2004, attended by over 70 participants from 15 different countries.
- I organised a workshop on 3-dimensional Geometry and Topology in Warwick in July 2007, jointly with Daryl Cooper.
- I jointly organised a Durham Symposium on the Geometry and Arithmetic of Lattices in July 2011.

PUBLICATIONS

1. The Whitney trick, **Topol. Appl.** 71 (1996) 115-118
2. Fox's congruence classes and the quantum-SU(2) invariants of links in 3-manifolds, **Comment. Math. Helv.** 71 (1996) 664-677
3. Surfaces, surgery and unknotting operations, **Math. Ann.** 308 (1997) 615-632
4. Dehn surgery on knots in 3-manifolds, **J. Amer. Math. Soc.** 10 (1997) 835-864
5. Upper bounds in the theory of unknotting operations, **Topology** 37 (1998) 63-73
6. (Joint with Daryl Cooper) Dehn surgery and negatively curved 3-manifolds, **J. Differential Geom.** 50 (1998) 591-624
7. Word hyperbolic Dehn surgery, **Invent. Math.** 140 (2000) 243-282
8. Taut ideal triangulations of 3-manifolds, **Geom. Top.** 4 (2000) 369-395
9. Attaching handlebodies to 3-manifolds, **Geom. Top.** 6 (2002) 889-904
10. Exceptional surgery curves in triangulated 3-manifolds, **Pacific J. Math.** 210 (2003) 101-163
11. The canonical decomposition of once-punctured torus bundles, **Comment. Math. Helv.** 78 (2003) 363-384
12. The volume of hyperbolic alternating link complements. **Proc. London Math. Soc.** 88 (2004) 204-224
13. The asymptotic behaviour of Heegaard genus, **Math. Res. Lett.** 11 (2004) 139-149
14. The Heegaard genus of amalgamated 3-manifolds, **Geom. Dedicata** 109 (2004) 139-145
15. A characterisation of large finitely presented groups, **J. Algebra** 287 (2005) 458-473
16. Expanders, rank and graphs of groups, **Israel J. Math.** 146 (2005) 357-370
17. Classification of alternating knots with tunnel number one, **Comm. Anal. Geom.** 13 (2005) 151-186

18. Heegaard splittings, the virtually Haken conjecture and Property (τ) , **Invent. Math.** 164 (2006) 317-359
19. Covering spaces of 3-orbifolds, **Duke Math J.** 136 (2007) 181-203
20. Some 3-manifolds and 3-orbifolds with large fundamental group, **Proc. Amer. Math. Soc.** 135 (2007) 3393-3402
21. Adding high powered relations to large groups, **Math. Res. Lett.** 14 (2007) 983-993
22. (Joint with Darren Long and Alan Reid) Covering spaces of arithmetic 3-orbifolds, **Int. Math. Res. Not.** (2008)
23. An algorithm to determine the Heegaard genus of simple 3-manifolds with non-empty boundary, **Alg. Geom. Top.** 8 (2008) 911-934
24. (Joint with Darren Long and Alan Reid) LERF and the Lubotzky-Sarnak conjecture, **Geom. Topol.** 12 (2008) 2047-2056
25. New lower bounds on subgroup growth and homology growth, **Proc. London Math. Soc.** 98 (2009) 271-297.
26. Large groups, Property (τ) and the homology growth of subgroups, **Math. Proc. Camb. Phil. Soc.** 146 (2009) 625-648
27. Surface subgroups of Kleinian groups with torsion, **Invent. Math.** 179 (2010) 175-190
28. The crossing number of composite knots, **J. Topology** 2 (2009) 747-768
29. (Joint with Daryl Cooper and Jessica Purcell) The length of unknotting tunnels, **Alg. Geom. Top.** 10 (2010) 637-661
30. Spectral geometry, link complements and surgery diagrams, **Geom. Dedicata** 147 (2010) 191-206
31. Detecting large groups, **J. Algebra** 324 (2010) 2636-2657
32. (Joint with Alexander Coward) Unknotting genus one knots, **Comment. Math. Helv.** 86 (2011) 383-399
33. Finite covering spaces of 3-manifolds, **Proc. International Congress Math.** Volume II, 1042-1070, Hindustan Book Agency, New Delhi, 2010
34. (Joint with Rob Meyerhoff) The maximal number of exceptional Dehn surgeries, **Invent. Math** (to appear)

PREPRINTS

35. (Joint with Alexander Coward) An upper bound on Reidemeister moves
36. Core curves of triangulated solid tori
37. The crossing number of satellite knots

OTHER

- A short article on my work appeared in the magazine **Science** in 2007.

DOCTORAL STUDENTS (TOGETHER WITH THE PAPERS ARISING FROM THEIR THESIS)

1. Stelios Koundouros (PhD 2003)
Universal surgery bounds on hyperbolic 3-manifolds, *Topology* 43 (2004) 497–512.
2. Alex Mijatovic (PhD 2003)
Simplifying triangulations of S^3 . *Pacific J. Math.* 208 (2003) 291–324.
Triangulations of Seifert fibred manifolds, *Math. Ann.* 330 (2004) 235–273.
Triangulations of fibre-free Haken 3-manifolds, *Pacific J. Math.* 219 (2005) 139–186.
Simplicial structures of knot complements, *Math. Res. Lett.* 12 (2005) 843–856.
3. Vivien Easson (PhD 2005)
Surface subgroups and handlebody attachment, *Geom. Topol.* 10 (2006) 557–591
4. Alexander Coward (PhD 2008)
Ordering the Reidemeister moves of a classical knot, *Algebr. Geom. Topol.* 6 (2006) 659–671.
Algorithmically detecting the bridge number of hyperbolic knots, Preprint.
5. Liam Wall (PhD 2010)
Homology in finite index subgroups, Thesis
6. Karin Alcaraz (started 2006)
The Alexander polynomial of closed 3-manifolds, Thesis
7. Jessica Banks
On links with locally infinite Kakimizu complexes, *Alg. Geom. Top.* (to appear)
Homogeneous links, Seifert surfaces, digraphs and the reduced Alexander polynomial,
Preprint
Minimal Genus Seifert Surfaces for Alternating Links, Preprint
The Kakimizu complex of a connected sum of links, Preprint

INVITED LECTURES

- * 1. MSRI, Berkeley, Low-dimensional topology workshop (August 1996)
- * 2. Newton Institute, Cambridge, 4-d geometry and quantum field theory (December 1996)
- * 3. UC Santa Barbara, Southern California Topology Conference (February 1997)
- * 4. Athens Georgia, Georgia Topology Conference (August 1997)
- * 5. Tokyo Institute of Technology, Workshop on orbifolds (July 1998)
- * 6. Oberwolfach, Topology meeting (September 1999)
- * 7. Warwick, Low-dimensional topology meeting (January 2000)
- * 8. Sheffield, British Topology meeting (April 2000)
- * 9. Montreal, 3-manifolds meeting (June 2001)
10. Lyon, French-American Congress of Mathematics (July 2001)

- * 11. Lyon, Conference on Property (τ) (May 2002)
- * 12. Xi'an, Satellite conference of the ICM (August 2002)
- * 13. Oberwolfach, Topology meeting (September 2002)
- * 14. Oberwolfach, meeting on hyperbolic 3-manifolds (May 2003)
- * 15. Oberwolfach, meeting on discrete groups and profinite groups (May 2003)
- * 16. Newton Institute, Cambridge, conference on Kleinian groups (August 2003)
- * 17. Banff International Research Station, 3-manifolds meeting (September 2003)
- * 18. CIRGET, Montreal, conference on 3-manifold theory (May 2004)
- 19. Toulouse, Canada-France Congress of Mathematics (July 2004)
- * 20. Oxford, Workshop on 3-dimensional geometry and topology (August 2004)
- 21. Liverpool, British Mathematics Colloquium, 'morning speaker' (April 2005)
- * 22. Austin, Texas, meeting on 3-manifolds (May 2005)
- * 23. ICTP, Trieste, conference on 3-manifold theory (June 2005)
- * 24. Institute of Advanced Study, Princeton, workshop on Lie groups, representations and discrete mathematics (3 talks in November 2005, 1 talk in February 2006) †
- * 25. ICMS, Edinburgh, 3-manifolds conference (3 talks, March 2006) †
- * 26. Oberwolfach, Topology meeting (September 2006)
- * 27. Oxford, launch meeting for the Journal of Topology (March 2007)
- * 28. Princeton, Thurston's 60th birthday conference (July 2007)
- * 29. Bristol, Heilbronn Annual Conference (September 2007)
- * 30. Trinity College, Dublin, meeting on pro- p groups and low-dim'l topology (September 2007)
- * 31. IPAM, UCLA, meeting on Expanders in Pure and Applied Mathematics (February 2008)
- * 32. Göttingen, Autumn School on Geometric Invariants of Groups (4 talks, November 2008) †
- * 33. Oxford, 60th birthday conference for Fritz Grunewald (April 2009) †
- * 34. Warwick, conference on Dehn filling (May 2009)
- * 35. Athens Georgia, Georgia Topology Conference (May 2009)
- * 36. Imperial College, London, conference on rank gradient (June 2009)
- * 37. UC Davis, Geometric topology in 3 and 4 dimensions (June 2009)
- 38. Cambridge, Young Researchers in Mathematics (March 2010)
- * 39. St Andrew's, Edinburgh Mathematical Society meeting (May 2010)
- 40. Hyderabad, International Congress of Mathematics (August 2010)
- * 41. Oxford, conference on the Geometry and Analysis of Groups (November 2010)
- * 42. Pisa, conference on the Geometric Topology of Knots (May 2011)
- * 43. London, centenary conference in honour of Poincaré (May 2012)

* denotes plenary talk

† available at <http://www.maths.ox.ac.uk/~lackenby>

SEMINARS AND COLLOQUIA (SINCE 2006)

1. Colloquium, Southampton (October 2006)
2. Colloquium, Warwick (November 2006)
3. Colloquium, Edinburgh (January 2007)
4. Topology seminar, Edinburgh (January 2007)
5. Topology seminar, Oxford (January 2007, 3 talks)
6. Colloquium, Durham (March 2007)
7. Colloquium, Aberdeen (October 2007)
8. Topology seminar, Oxford (May 2008, 2 talks)
9. Public lecture on the Poincaré conjecture, Oxford (July 2008)
10. Pure maths seminar, Queen Mary's College, London (September 2008)
11. Lecture, the Chancellor's Court of Benefactors, Oxford (October 2008)
12. Topology seminar, Cambridge (October 2008)
13. Geometry, topology & dynamics seminar, Orsay (February 2009)
14. Topology seminar, Oxford (March 2009)
15. Operator algebras seminar, Paris VII (June 2009)
16. Analysis and geometry seminar, Paris VII (October 2009)
17. Analysis and geometry seminar, Paris VII (November 2009)
18. Pure maths seminar, Royal Holloway, London (May 2011)
19. Topology seminar, Cambridge (May 2012)
20. Geometry and topology seminar, Imperial College, London (May 2012)

Before 2006, I gave seminars at the following universities:

Oxford, Cambridge, Warwick, Imperial College (London), Queen Mary's College (London), King's College (London), University College (London), Edinburgh, Aberdeen, Leicester, Liverpool, Southampton, Newcastle, Sheffield, UC Berkeley, UC Davis, UC Santa Barbara, UC Irvine, Stanford, U Texas at Austin, U Georgia at Athens, U Illinois at Chicago, Princeton, Cornell, Columbia, U Montreal

TEACHING

I am strongly committed to teaching, both at undergraduate and graduate levels. For graduate students, post-docs and fellow faculty members, I organise regular advanced classes on a variety of topics. I have also designed a new lecture course Topology & Groups, which is aimed at third and fourth year undergraduates.

In 2006, I was awarded an *Excellence in Teaching Award*.

UNDERGRADUATE COURSES

| <i>Term</i> | <i>Title</i> |
|---------------------|---|
| MT 2000 | Differential equations and discrete mathematics |
| HT 2001, 2002, 2003 | Algebraic topology |
| MT 2001 | Differential and difference equations |
| MT 2004, 2006, 2008 | Topology & Groups |
| HT 2011 | Algebraic topology |
| HT 2011 | Topology |

GRADUATE COURSES

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|-------------|-----------------------------|
| 1998 & 1999 | Hyperbolic manifolds |
| 2000 | Three-dimensional manifolds |

ADVANCED CLASSES

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|------|--|
| 2000 | Teichmüller spaces |
| 2001 | \mathbb{R} -trees |
| 2002 | The Seifert fibre space theorems |
| 2003 | Isomorphism problem for word hyperbolic groups |
| 2006 | Property (τ) |
| 2007 | Hyperbolicity of the curve complex |
| 2008 | Virtual fibering of 3-manifolds |
| 2009 | Cube complexes |
| 2010 | The Dehn function of $SL(n, \mathbb{Z})$ |
| 2011 | Quantum invariants and Property T |
| 2012 | Cube complexes |

ADMINISTRATION

DEPARTMENTAL COMMITTEES

| | |
|--------------|-------------------------------|
| 2000-02 | Teaching committee |
| 2001-02 | Course structure committee |
| 2011-12 | Syllabus review working party |
| 2012-present | Departmental committee |

COLLEGE COMMITTEES

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|--------------|---------------------------|
| 2001-04 | Domestic committee |
| 2002 | Mastership committee |
| 2002-04 | Nominating committee |
| 2002-08 | Finance committee |
| 2009-present | Academic policy committee |
| 2012-present | Investment subcommittee |