Prof. Dan M. Ciubotaru

CONTACT
INFORMATION

Mathematical Institute
University of Oxford
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Radcliffe Observatory Quarter
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ACADEMIC
POSITIONS

September 2014– . Associate Professor, University of Oxford.

September 2014– . Tutorial Fellow at Somerville College, Oxford.

July 2011–August 2014. Associate Professor, University of Utah.

July 2007–June 2011. Assistant Professor, University of Utah.

July 2004–June 2007. C.L.E. Moore Instructor, Massachusetts Institute of Technology.

Visiting Professor/Scholar:

June 2016: Weizmann Institute, Israel;
March/April 2016: Aix-Marseille Université;
November 2013. Hong Kong University of Science and Technology;
September 2013. Massachusetts Institute of Technology;
May 2012. Hong Kong University of Science and Technology;
August 2011. Max Planck Institute, Bonn;
June 2008. Max Planck Institute, Bonn.

EDUCATION

Cornell University, Ithaca, NY

- Ph.D., Department of Mathematics, August 2004
- Thesis: Unitary representations of split p-adic exceptional groups
- Advisor: Prof. Dan Barbasch

Babeş-Bolyai University, Cluj-Napoca, Romania
- B.S. and M.A., Department of Mathematics and Computer Science, July 1998
- Advisor: Prof. Andrei Mărcuş

RESEARCH
GRANTS

Engineering and Physical Sciences Research Council, UK

EPSRC EP/N033922/1 09/2016–08/2020, Standard Grant, *Dirac operators in representation theory*, Principal Investigator, 09/2016–09/2020, £432K.

National Science Foundation, USA

NSF-DMS 1302122, 07/2013–09/2016, Standard Grant, *Unitary representations of affine Hecke algebras and reductive p-adic groups*, Principal Investigator (transferred in September 2014 to Dr. Baiying Liu), $135K.

NSF-DMS 0968065, 07/2010–06/2013, Standard Grant (part of the Focused Research Group *Atlas of Lie groups: Unitary representations*), Principal Investigator, $87K.

NSF-DMS 0554278, 07/2007-06/2006, FRG collaborative grant, *Atlas of Lie groups and representations*, Personnel, $40K.

NSF-DMS 0532088, 07/2005-06/2006, FRG collaborative grant, *Atlas of Lie groups and representations*, Personnel, $10K.

National Security Agency – Mathematical Sciences Program, USA

NSA-AMS 111016, 04/2013–09/2014, Young Investigator Award, *Dirac cohomology of unitary Hecke algebra modules*, Principal Investigator, $30K.

NSA-AMS 081022, 01/2010–01/2012, Young Investigator Award, *Unitary modules of affine Hecke algebras*, Principal Investigator, $30K.

TEACHING AWARDS	M.A. Oxford (2014), degree by resolution. Faculty Undergraduate Teaching Award (2011), Department of Mathematics, University of Utah. Graduate Student Teaching Award (2003), Department of Mathematics, Cornell University.
PAPERS	**Preprints**

Preprints

1. Cocenters of p-adic groups III: elliptic and rigid cocenters, with X. He, `arXiv:1703.00378`, 23 pages.

2. An Euler-Poincaré formula for a depth zero Bernstein projector, with D. Barbasch and A. Moy, `arXiv:1610:01310` (2016), 38 pages.

3. Hermitian forms for affine Hecke algebras, with D. Barbasch, `arXiv:1312.3316v2` (2015), 29 pages.

To appear

4. A uniform classification of discrete series representations of affine Hecke algebras, with E. Opdam, `arXiv:1510.07274v2` (2016), 36 pages, *Algebra and Number Theory.*

5. One-W-type modules for rational Cherednik algebra and cuspidal two-sided cells, `arXiv:1503.07890`, 29 pages, *Bull. Inst. Math. Acad. Sinica*, volume in honor of George Lusztig on the occasion of his 70th birthday.

6. On the elliptic nonabelian Fourier transform for unipotent representations of p-adic groups, with E. Opdam, `arXiv:1604.00604`, 18 pages, *"Representation Theory, Number Theory, and Invariant Theory: In Honor of Roger Howe on the Occasion of His 70th Birthday"*, Progr. Math., Birkhäuser.

7. Star operations for affine Hecke algebras, with D. Barbasch, `arXiv:1504.04361`, 27 pages, volume in honor of Wilfried Schmid.

8. Cocenters and representations of affine Hecke algebras, with X. He, `arXiv:1409.0902`, 32 pages, in *Jour. Eur. Math. Soc.*

Published

9. Dirac cohomology for symplectic reflection algebras, *Selecta Math.* **22** (2016), no. 1, 111–144.

10. Ladder representations of $GL(n, Q_p)$, with D. Barbasch, Representations of Reductive Groups: in honor of the 60th birthday of David A. Vogan, Jr., *Progr. Math.* **312**, Birkhäuser (2016), 117–137.

11. The cocenter of graded affine Hecke algebra and the density theorem, with X. He, in *J. Pure Appl. Algebra* **220** (2016), no. 1, 382–410.

12. Green polynomials, elliptic pairings, and the extended Dirac operator, with X. He, *Adv. Math.* **283** (2015), 1–50.

13. Formal degrees of unipotent discrete series representations and the exotic Fourier transform, with E. Opdam, *Proc. London Math. Soc.* **110** (2015), no. 3, 615–646.

14. Dirac cohomology of one-W-type representations, with A. Moy, *Proc. Amer. Math. Soc.* **143** (2015), no. 3, 1001–1013.

15. Unitary Hecke modules with nonzero Dirac cohomology, with D. Barbasch, *Symmetry in Representation Theory and Its Applications: in honor of Nolan Wallach*, Progress in Mathematics, Birkhäuser **257** (2015), 1–20.

16. Special unipotent representations, with P. Trapa, in appendix (6 pages) to "Small representations, string instantons, and Fourier modes of Eisenstein series" by M. B. Green, S. D. Miller, and P. Vanhove, *J. Number Theory* **146** (2015), 187–309.

17. Algebraic and analytic Dirac induction for graded affine Hecke algebras, with E. Opdam and P. Trapa, *J. Inst. Math. Jussieu* **13** (2014), no. 3, 447–486.

18. Unitary equivalences for reductive p-adic groups, with D. Barbasch, *Amer. J. Math.* **135** (2013), no. 6, 1633–1674.

19. Characters of Springer representations on elliptic conjugacy classes, with P. Trapa, *Duke Math. J.* **162** (2013), no. 2, 201–223.

20. Dirac cohomology for graded affine Hecke algebras, with D. Barbasch and P. Trapa, *Acta Math.* **202** (2012), no. 2, 197–227.

21. Spin representations of Weyl groups and Springer's correspondence, *J. Reine Angew. Math.* **671** (2012), 199–222.

22. On characters and formal degrees for classical affine Hecke algebras, with M. Kato and S. Kato, *Invent. Math.* **187** no. 3 (2012), 589–635.

23. Duality for $GL(n,R)$, $GL(n,Q_p)$, and the degenerate affine Hecke algebra for $gl(n)$, with P. Trapa, *Amer. J. Math.* **134** (2012), 1–30.

24. Regular orbits of symmetric subgroups on partial flag varieties, with K. Nishiyama and P. Trapa, *Representation Theory, Complex Analysis, and Integral Geometry*, Birkhäuser (2012), 61–86.

25. Tempered modules in exotic Deligne-Langlands correspondence, with S. Kato, *Adv. Math.* **226**, issue 2 (2011), 1538–1590.

26. Functors for unitary representations of real classical groups and affine Hecke algebras, with P. Trapa, *Adv. Math.* **227** (2011), no. 4, 1585–1611.

27. Reducibility of generic unipotent standard modules, with D. Barbasch, *J. Lie Theory* **21** (2011), no. 4, 837–846.

28. Ramanujan bigraphs arising from p-adic $SU(3)$, with C. Ballantine, *Proc. Amer. Math. Soc.* **139** (2011), no. 6, 1939–1953.

29. Whittaker unitary dual for affine graded Hecke algebras of type E, with D. Barbasch, *Compositio Math.* **145**, issue 6 (2009), 1563–1616.

30. On unitary unipotent representations of p-adic groups and affine Hecke algebras with unequal parameters, *Represent. Theory* **12** (2008), 453–498.

31. Multiplicity matrices for the affine graded Hecke algebra, *J. Algebra* **320** (2008), 3950–3983.

32. Unitarizable minimal principal series of reductive groups, with D. Barbasch and A. Pantano, *Contemp. Math.*, **472**, Amer. Math. Soc., 2008, 63–136.

33. Unitary I-spherical representations for split p-adic E_6, *Represent. Theory* **10** (2006), 435–480.

34. Spherical unitary principal series, with D. Barbasch, *Pure Appl. Math. Q.* **1** (2005), no. 4, 755–789.

35. The unitary I-spherical dual of split p-adic F_4, *Represent. Theory* **9** (2005), 94–137.

TEACHING

University of Oxford
C2.1 Lie algebras: MT 2014, MT 2015, MT 2016;
C2.3 Representations of semisimple Lie algebras (created the course in Hilary 2016): HT 2016, HT 2017;
Tutorials in Pure Maths (Somerville College), intercollegiate classes (Maths Institute).

University of Utah
Modern Algebra I, Modern Algebra II, Topics in Representation Theory, Graduate Complex Analysis, Foundations of Analysis I, Foundations of Analysis II, Multivariable Calculus, Discrete Mathematics, Trigonometry, Business Algebra.

Massachusetts Institute of Technology
Analysis I (published by MIT OpenCourseWare), Mathematical Methods for Engineering I, Linear Algebra (published by MIT OpenCourseWare), Seminar in Analysis (Applications to number theory), Calculus I.

Cornell University
Calculus for Engineers, Calculus I, Calculus II.

INVITED TALKS **Conferences, Workshops**

- Representation Theory XV, Dubrovnik, Croatia, June 2017.

- Representation theory of reductive groups over local fields and applications to automorphic forms, Weizmann Institute, Israel, June 2017.

- Elliptic unipotent representations of reductive p-adic groups, Harmonic analysis on Lie groups and group algebras of locally compact groups, TSIMF, Sanya, China, December 2016.

- Dirac cohomology for rational Cherednik algebras, New perspectives in representation theory, workshop, Leeds, July 2016.

- Tutorial on affine Hecke algebras I-III, Recent developments in representation theory, graduate school and conference, Singapore, March 2016.

- Dirac cohomology for rational Cherednik algebras and two-sided cells, Representation theory of algebraic groups, a conference in honor of George Lusztig on his 70th birthday, Academia Sinica, Taipei, January 2016.

- Formal degrees and the nonabelian Fourier transform, Workshop in Representation Theory, Korteweg-de Vries Institute, Amsterdam, September 2015.

- Dirac cohomology for symplectic reflection algebras, Conference on Reductive groups, Franken-Akademie, Schloss Schney, Germany, August 2015.

- Characters of unipotent discrete series of semisimple p-adic groups (2 lectures), Summer School: Reductive groups, Franken-Akademie, Schloss Schney, Germany, August 2015.

- Formal degrees of unipotent discrete series representations, Representation theory, number theory, and invariant theory, a conference in honor of Roger Howe on his 70th birthday, Yale University, June 2015.

- Formal degrees and the nonabelian Fourier transform, Representations of reductive groups, a conference dedicated to David Vogan on his 60th birthday, M.I.T., Cambridge, MA, May 2014.

- Dirac operators for graded affine Hecke algebras (5 lectures), Spring school: Representation theory and geometry of reductive groups, Heiligkreuztal, Germany, March 2014.

- Generic unitary representations of quasi-split p-adic groups, Whittaker functions: number theory, geometry, physics, workshop B.I.R.S., Banff, Canada, October 2013.

- Elliptic representations, Green polynomials, and the Dirac index, Representations of reductive groups, Salt Lake City, July 2013.

- The Dirac index for graded Hecke algebra modules, Representation Theory XIII, Dubrovnik, Croatia, June 2013.

- Cocenters of affine Hecke algebras, Special session on Noncommutative rings, International Joint Meeting A.M.S.-R.M.S., Alba-Iulia, Romania, June 2013.

- Green polynomials and representations of the pin cover of the Weyl group, Algebraic groups and Representation theory, a conference in the memory of T. A. Springer, Hong Kong, January 2013.

- Discrete series Hecke modules and the Dirac index, Representations des groupes reductifs p-adiques, Ile de Porquerolles, France, June 2012.

- Preservation of unitarity for Bernstein components, Texas-Oklahoma Representations and Automorphic forms II, Stillwater, OK, April 2012.

- Formal degrees of unipotent discrete series representations, Special session on New Trends in Representation theory, A.M.S. National Meeting, Boston, MA, January 2012.

- Functors for representations of classical real groups and degenerate Hecke algebras, Analysis on Lie groups, Max Planck Institut of Mathematics, Bonn, Germany, August 2011.

- The Dirac operator for graded Hecke algebras, Double Affine Hecke Algebras and the Langlands Program, CIRM Luminy, France, June 2011.

- The Dirac operator for graded Hecke algebras, International Workshop on Representation Theory and Harmonic Analysis, Nankai University, Tianjin, China, June 2011.

- Dirac operators for graded Hecke algebras and spin representations of Weyl groups, Workshop on structure and representations of exceptional groups, Banff, Canada, July 2010.

- Unitary correspondences for Bernstein components, Representations des groupes reductifs p-adiques, Ile de Porquerolles, France, June 2010.

- Special session on Hecke algebras and deformations on geometry and topology, A.M.S. Sectional Meeting, St. Paul, MN, April 2010.

- Characters of discrete series of affine Hecke algebras (2 lectures), Workshop on nilpotent orbits and representation theory, Hokkaido University, Sapporo, February 2010.

- Formal degrees of discrete series for classical affine Hecke algebras, Special session on Lie groups and automorphic forms, Canadian Mathematical Society winter meeting, Windsor, ON, December 2009.

- Functors for classical real groups and graded affine Hecke algebras, Representation theory of real reductive groups, Salt Lake City, July 2009.

- Functors for classical real groups and graded affine Hecke algebras, Functional Analysis XI, Dubrovnik, Croatia, June 2009.

- Unitary ramified principal series of split p-adic groups, Functional Analysis X, Dubrovnik, Croatia, July 2008.

- Atlas of Lie groups and representations I–VI, American Mathematics Institute, Palo Alto, CA, 2003–2008.

- Whittaker generic unitary representations with Iwahori fixed vectors, Workshop in representation theory and geometry, Tambara seminar house, University of Tokyo, August 2007.

- Unitary representations of reductive p-adic groups, 6-th Congress of Romanian mathematicians, Bucharest, June 2007.

- On the unitary dual of Iwahori-Hecke algebras, Special session on representation theory and the theta correspondence, A.M.S. National Meeting, New Orleans, LA, January 2007.

- Spherical unitary representations of split groups, Representation theory of real reductive groups, Snowbird, June 2006.

- Spherical unitary principal series for Hecke algebras with unequal parameters, Special session on algebraic groups, A.M.S. Sectional Meeting, Durham, NH, April 2006.

- The spherical unitary dual for split p-adic exceptional groups, Special session on representation theory of reductive groups, A.M.S. Sectional Meeting, Evanston, IL, October 2004.

Colloquia, Seminars

- Aix-Marseille Université, Minicourse "Affine Hecke algebras", March-April 2017.

- Aix-Marseille Université, Number Theory and Representation Theory seminar, March 2017.

- Durham University, Pure Maths Colloquium, January 2017.

- Cambridge University, Number Theory Seminar, November 2016.

- Korteweg-de Vries Institute for Mathematics, University of Amsterdam, June 2016, April 2015, July 2014, October 2013.

- University of Paris VII, Representation Theory seminar, January 2016.

- University of York, Algebra seminar, September 2015.

- Mathematical Institute, University of Oxford, February 2016, May 2015, February 2015, February 2014.

- Northeastern University, January 2014.

- Boston College, Algebraic geometry and number theory seminar, September 2013.

- Massachusetts Institute of Technology, Lie groups seminar, September 2013 (2 talks), December 2011, May 2007, May 2006, February 2005, October 2004, September 2004.

- University of Utah, Representation theory seminar, November 2012, February 2012, September 2010, November 2008, September 2007, January 2007, April 2006.

- University of Hong Kong, Colloquium, May 2012.

- Hong Kong University of Science and Technology, Lie groups seminar, 3 talks, May 2012.

- Université Blaise Pascal, Clermont-Ferrand, France, Seminar in Pure Math, June 2011.

- University of Notre Dame, Colloquium and Lie Theory seminar, October 2010.

- Kyoto University, Number Theory seminar, February 2010.

- Babeş-Bolyai University, Romania, Algebra seminar, July 2009, June 2009.

- Idaho State University, Colloquium, February 2008.

- University of Utah, Colloquium, January 2007.

- University of British Columbia, Colloquium and Algebra seminar, January 2007.

- University of Massachusetts, Amherst, Representation theory seminar, April 2005.

- University of Maryland, College Park, Lie groups and representation theory, November 2004.

- Joint Princeton University/IAS Number Theory Seminar, March 2004.

- Rutgers University, New Brunswick, Lie Groups Seminar, October 2003.

- Cornell Lie Groups Seminar, November 2002.

Mentorship	**Postdoctoral researchers.**

Dr. Marcelo Gonçalves de Martino (Oxford, 2016–2018), grant EPSRC EP/N033922/1.
Dr. Baiying Liu (Utah, 2013–2015), grant NSF-DMS 1302122.

Students supervision.

Kieran Calvert (Oxford, current DPhil student, 2015–).
Teresa Conde (Oxford, DPhil 2016, principal supervisor: Karin Erdmann).
Kei Yuen Chan (Utah, PhD 2014, principal supervisor: Peter Trapa).
Benjamin Trahan (Utah, PhD 2011, co-supervised with Peter Trapa).

Oxford MFOCS theses: Rhory Ashworth (2017), William Murphy (2017), Christopher Pettitt (2016).

Supervised 2 undergraduate summer research project in Oxford (2016, 2017) and 3 Research Experience for Undergraduates projects in Utah (2012–2014).

DPhil Examiner

External Examiner, University of Amsterdam, Ph.D. thesis (2015).
Internal Examiner, Oxford: one DPhil thesis (2015), one transfer viva (2015).
Internal Examiner, University of Utah: five Ph.D. theses (2009–2014).

University of Oxford.
Member of the hiring committee for an APTF in Applied Maths (Networks), joint Somerville, January-February 2017.
Member of the hiring committee for a departmental lecturer position in Applied Maths (joint Somerville), September 2016.
Chair of the hiring committe for a postdoctoral position in Pure Maths, May 2016.

Somerville College, Oxford.
Member of the Governing Body, since October 2014.
Member of the Education Committee, since October 2014, Buildings Committee, 2016-17.
Admissions for Somerville College, since 2014.
Personal tutor for Somerville Maths undergraduates and College adviser for graduate students.
Member of the interviewing committee for the Fulford JRFs in Science, June 2016.

University of Utah.
Committee work: graduate recruitment (2009–2014); hiring (2012–2013); math circles (2008–2009, 2011–2012); undergraduate colloquium (2007–2010); library committee (2008–2009), Science Day (2012); member of several oral exam and Ph.D final defense committes.

Organized: Representation theory seminar, 2008–2011; Math Circle for high school students (2008-2009 and 2012-2013); ACCESS session lecturer, June 2010; Early Research Directions: Representation Theory, Spring 2008; graduate reading courses.

Editor of *Documenta Mathematica*, since 2015.

Panelist for the Representation Theory section at the National Science Foundation (USA), twice.

Refereed grant applications for National Science Foundation (USA), National Security Agency (USA), European Research Committee, CNRS (France).

Organized (with C. Kriloff and P. Trapa) a special session on Reductive groups and Hecke algebras at the A.M.S. Sectional Meeting, Salt Lake City, UT, October 2011.

Refereed papers for mathematical journals, including: Advances in Mathematics, Compositio Mathematica, Journal of Institute Jussieu, Selecta Mathematica, J. Reine Angew. Math., Representation Theory, Proceedings L.M.S., Transactions Amer. Math. Soc. . . .

Member of the American Mathematical Society (since 2003) and London Mathematical Society (since 2014).