

CURRICULUM VITAE

MATT KERR

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Born August 5th, 1975 in Washington, D.C.

Citizenship: U.S.

Education:

Ph.D. Princeton University, January 2003
Advisor: Phillip A. Griffiths

B.A. University of Virginia, May 1997, *summa cum laude* in mathematics and physics
Undergraduate Advisor: David Brydges

Employment:

Member, Institute for Advanced Study, Princeton, NJ, Sept 2014 - July 2015
Associate Professor, Washington University in St. Louis, July 2013 - present
Assistant Professor, Washington University in St. Louis, Aug. 2010 - June 2013
Lecturer, Durham University, Fall 2007 - July 2010
L.E. Dickson Instructor, University of Chicago, Fall 2004 - Summer 2007
Postdoctoral Fellow, Max-Planck-Institute for Mathematics, Bonn, Germany, Jan.-Aug. 2005
Adjunct Assistant Professor, UCLA Math Department, Fall 2002 - Summer 2004

Grants and Academic Honors:

NSF FRG Grant DMS-1361147 (PI), July 2014 - June 2017, \$301,874
NSF Conference Grant DMS-1259024 (PI), June 2013, \$28,030
NSF Standard Grant DMS-1068974 (PI), July 2011 - June 2014, \$127,412
EPSRC First Grant EP/H021159/1 (PI), Jan. 2010 - July 2010, 102K GBP, terminated by move
National Science Foundation Graduate Fellowship, 1997-2000
E.J. McShane Prize, University of Virginia Mathematics Department, 1997
James W. Elkins Award, University of Virginia Physics Department, 1997
Barry M. Goldwater Scholarship, 1996-7

Research Interests:

Algebraic Geometry
Hodge Theory
Mathematical Physics

Memberships:

Member, American Mathematical Society, Aug. 2009 - present
Fellow, Higher Education Academy (UK), Nov. 2008 - present

Research Publications:

- Boundary components of Mumford-Tate domains*, joint with G. Pearlstein, 58 pp., to appear in Duke Math. J.
- A Feynman integral via higher normal functions*, joint with S. Bloch and P. Vanhove, 70 pp., to appear in Compositio Math.
- Arithmetic of degenerating principal variations of Hodge structure: examples arising from mirror symmetry and middle convolution*, joint with G. da Silva Jr. and G. Pearlstein, 31 pp., to appear in Canadian Math. J.
- Naive boundary strata and nilpotent orbits*, joint with G. Pearlstein, to appear in Ann. Inst. Fourier.
- Algebraic cycles and local quantum cohomology*, joint with C. Doran, 21 pp., to appear in CNTP.
- Algebraic and arithmetic properties of period maps*, to appear in Fields Inst. Commun. Appendix to *Reciprocity laws on algebraic surfaces via iterated integrals*, joint with I. Horozov, to appear in J. of K-Theory.
- Normal functions, Picard-Fuchs equations, and elliptic fibrations on K3 surfaces*, joint with X. Chen, C. Doran, and J. Lewis, to appear in Crelle's Journal.
- "Hodge theory, complex geometry, and representation theory (v. 1)" (book), joint with M. Green and P. Griffiths, 406 pp., CBMS Reg. Conf. Series in Math, No. **118**, AMS, 2013.
- Cup products in automorphic cohomology: the case of Sp_4* , 44 pp., in "Hodge theory, complex geometry, and representation theory (v. 2)", Contemp. Math. **608**, AMS, 2014, 199-234.
- Notes on the representation theory of $SL_2(\mathbf{R})$* , 34 pp., in "Hodge theory, complex geometry, and representation theory (v. 2)", Contemp. Math. **608**, AMS, 2014, 173-198.
- Special values of automorphic cohomology classes*, joint with M. Green and P. Griffiths, 145 pp., Memoirs of the AMS **231**, No. 1088, 2014.
- Shimura Varieties: a Hodge-theoretic perspective*, 45 pp., in "Hodge Theory", Math. Notes **49**, Princeton Univ. Press, 2014.
- On the isomorphism question for complete Pick multiplier algebras*, joint with J. McCarthy and O. Shalit, Integral Equations and Operator Theory **76** (2013), no. 1, 39-53.
- Indecomposable K_1 of elliptically fibered K3 surfaces: a tale of two cycles*, in "Arithmetic and geometry of K3 surfaces and Calabi-Yau threefolds", 387-409, Fields. Inst. Commun. 67, Springer, New York, 2013.
- "Mumford-Tate groups and domains: their geometry and arithmetic" (book), joint with M. Green and P. Griffiths, Annals of Math. Studies, no. **183**, Princeton University Press, 2012, 289 pp.
- Algebraic K-theory of toric hypersurfaces*, joint with C. Doran, CNTP **5** (2011), no.2, 397-600.
- Normal functions and the GHC*, joint with G. Pearlstein, RIMS Kokyuroku **1745** (2011), 71-75.
- Mumford-Tate domains*, joint with M. Green and P. Griffiths, Bollettino dell'Unione Math. Ital. **3** (2010), no. 2, 281-308.
- An exponential history of functions with logarithmic growth*, joint with G. Pearlstein, in "Topology of Stratified Spaces", MSRI Pub. **58**, Cambridge Univ. Press, 2011, 281-374.
- The sheaf of nonvanishing meromorphic functions in the projective algebraic case is not acyclic*, joint with X. Chen and J. Lewis, C. R. Acad. Sci. Paris, Ser. I **348** (2010), 291-293.
- Néron models and limits of Abel-Jacobi mappings*, joint with M. Green and P. Griffiths, Compositio Math. **146** (2010), 288-366.
- Some enumerative global properties of variations of Hodge structure*, joint with M. Green and P. Griffiths, Moscow Math J. **9** (2009), 469-530.
- Higher Abel-Jacobi Maps for 0-cycles*, J. of K-theory **1** (2008), 1-55.
- Neron models and boundary components for degenerations of Hodge structures of mirror quintic type*, joint with M. Green and P. Griffiths, in "Curves and Abelian Varieties

(V. Alexeev, Ed.)”, Contemp. Math **465** (2007), AMS, 71-145.
The Abel-Jacobi Map for Higher Chow Groups, II, joint with J. Lewis, 67 pp., Invent. Math. **170** (2007), 355-420.
A survey of transcendental methods in the study of Chow groups of 0-cycles, in “Mirror Symmetry V (Banff, 2003)”, AMS/IP Stud. Adv. Math. **38** (2006), 295-349.
Exterior products of 0-cycles, J. reine angew. Math **600** (2006), 1-23.
The Abel-Jacobi Map for Higher Chow Groups, joint with J. Lewis and Stefan Muller-Stach, Compositio Math. **142** (2006), no. 2, 374-396.
An Elementary Proof of Suslin Reciprocity, Canad. Math. Bull. **48** v.2 (2005), pp. 221-236.
A Regulator Formula for Milnor K-groups, K-Theory **29** (2003) pp. 175-210.

Research Preprints:

Normal functions over locally symmetric varieties, joint with R. Keast, preprint, 22 pp., 2015.
Simplicial Abel-Jacobi maps and reciprocity laws, joint with J. Lewis and P. Lopatto, preprint, 42 pp., 2015.
Hodge theory and real orbits in flag varieties, joint with C. Robles, preprint, 82 pp., 2014.
 “Geometric Construction of Regulator Currents with Applications to Algebraic Cycles”, Princeton Ph.D. Thesis, 355 pp.

Invited Talks:

Workshop on Hodge Theory, Moduli, and Representation Theory, Stony Brook Univ., Jan. 4-9, 2015.
 “Cohomological Realizations of Motives”, BIRS, Banff, Canada, Dec. 7-12, 2014.
 Valley geometry Seminar, U. Mass – Amherst, Nov. 21, 2014.
 AMS meeting, special sessions on “Mirror Symmetry” and “Geometry and Combinatorics on Homogeneous Spaces”, UNC-Greensboro, Nov. 8-9, 2014.
 Workshop on Fundamental Groups and Periods, Institute for Advanced Study, Princeton, Oct. 13-17, 2014.
 “Algebraic Varieties: Bundles, Topology, Physics”, VBAC, Freie Univ. Berlin, Sept. 1-5, 2014.
 Workshop on Hodge Theory, Moduli, and Representation Theory, Texas A&M, Sept. 14-19, 2014.
 Univ. of Alberta Geometry Seminar, June 23, 2014.
 Texas A&M Algebraic Geometry Seminar, May 29, 2014.
 Oregon State Math. Department Colloquium, May 12, 2014.
 Workshop on “Hodge Theory in String Theory”, Fields Inst. (Toronto, Canada), Nov. 18-22, 2013.
 Mathematical Congress of the Americas, Special Session on “Contemporary Trends in Algebraic Geometry and K-Theory”, Guanajuato, Mexico, Aug. 5-9, 2013.
 “Polylogarithms as a Bridge Between Number Theory and Particle Physics”, Durham, UK, July 3-12, 2013.
 Summer school and conference on “Recent Advances in Hodge Theory: Period Domains, Algebraic Cycles, and Arithmetic” (3 talks), UBC (Vancouver, Canada), June 10-20.
 “Moduli Spaces and their Invariants in Mathematical Physics”, CRM (Montreal, Canada), June 3-14, 2013.
 Univ. of Maryland Math Department Colloquium, March 13, 2013.
 Workshop on “Algebraic cycles, motives, and geometry”, UNAM, Mexico City, Feb 18-23, 2-13.
 Université Paris XIII Math Department Seminar, Jan. 9, 2013.
 Southern Illinois Univ. Carbondale Math Department Seminar, Nov. 13, 2012
 AMS meeting, session on “Motives, Algebraic Cycles and K-Theory”, University of Arizona, October 27-28, 2012.

Canadian Number Theory Association XII Meeting, Special Session on Number Theory
 and Physics, University of Lethbridge, June 17-22, 2012
 NSF/CBMS Conference on “Hodge Theory, Complex Geometry, and Representation Theory”
 (2 talks), Texas Christian University, June 18-22, 2012
 Texas A&M Working Seminar in Geometry (5 talks), May 14-18, 2012
 Special Number Theory Seminar, Institute for Advanced Study, Princeton, March 30, 2012
 Algebra, Geometry, and Physics Seminar, Stony Brook University, March 14, 2012
 Workshop on the Arithmetic and Geometry of Algebraic Varieties, Fields Institute, Nov. 19-20,
 2011
 Conference on the Arithmetic and Geometry of K3 Surfaces and CY Threefolds, Fields
 Institute, Aug 16-25, 2011
 “Number Theory and Physics at the Crossroads”, BIRS (Banff), May 8-13
 Show-me Algebraic Geometry Conf., Columbia, MO, May 7-8, 2011
 Texas A&M Geometry Seminar, Feb. 7, 2011
 Purdue Algebraic Geometry Seminar, Jan. 19, 2011
 AMS meeting, session on “Number Theory and Physics”, Notre Dame, Nov. 6, 2010
 “Regulators III” Conference, Barcelona, July 12 - July 22, 2010
 ICTP Summer School on Hodge Theory (7 talks), ICTP (Trieste), June 14 - July 3, 2010
 University of Cambridge Geometry Seminar, May 19, 2010
 Washington University Colloquium and Algebraic Geometry seminar, Jan. 25-26, 2010
 University of Alberta Colloquium and Algebra Seminar, Jan. 18-19, 2010
 University of Alberta Algebra Seminar, Nov. 30, 2009
 Oxford University Algebraic Geometry Seminar, Oct. 13, 2009
 Workshop on Homological Mirror Symmetry and Hodge Theory, Universität Wien
 (3 talks), Aug. 8-12, 2009
 Hodge Theory and Algebraic Geometry, A Symposium in Honor of S. Usui, RIMS
 (Kyoto, Japan), June 23-July 3, 2009
 Michigan State University Colloquium and Algebra Seminar, April 23-24, 2009
 Durham Arithmetic Study Group (3 talks), Feb.-March 2009
 MPIM-Bonn Number Theory Seminar, Jan. 12, 2009
 Universität Wien, Jan. 7, 2009
 University of Exeter Colloquium, Nov. 27, 2008
 University of Bristol Colloquium, Nov. 26, 2008
 Cambridge Geometry Seminar, Nov. 12, 2008
 COW/Geometry-Topology Seminar, Imperial College London, Nov. 6, 2008
 Algebraic and Differential Geometry, A Conference in Celebration of the 70th Birthday of
 Phillip Griffiths, IAS, Oct. 16-17, 2008
 BIRS Workshop (Banff, AB, Canada), Number Theory and Physics at the Crossroads,
 Sept. 21-26, 2008
 MSRI Workshop (Berkeley, CA), Topology of Stratified Spaces, Sept. 8-12, 2008
 University of Washington (US), Superseminar, April 17, 2008
 University of Alberta (Canada), Conference on Regulators and heights in Algebraic
 Geometry, April 11-16, 2008
 BIRS Workshop on Hodge Theory, April 6-11, 2008
 University of Chicago Algebra Seminar, April 2, 2008
 University of Durham Colloquium, Jan. 2008
 University of Washington conference on $K3$ surfaces and string dualities (4 talks), July 2007
 University of Durham, May 18, 2007
 University of Georgia conference on Moduli of Curves and Abelian Varieties,
 Athens, GA, April 2007
 University of Wisconsin Geometry Seminar, March 2, 2007

Georgia Tech Algebra Seminar, February 5, 2007
 Johns Hopkins University Colloquium, January 25, 2007
 Purdue University Algebraic Geometry Seminar, January 10, 2007
 CMS Conference, workshop on C-Y Varieties and Mirror Symmetry, Toronto, Dec. 7, 2006
 Texas A&M University, October 13, 2006
 Universität Mainz (2 talks), June-July 2006
 Motives and Periods Conference, PIMS/UBC, June 7, 2006
 Ohio State University Algebraic Geometry Seminar, May 18, 2006
 University of Chicago Algebraic Geometry Seminar, April 26, 2006
 UIC Algebraic Geometry Seminar, April 17, 2006
 Fields Institute Weekend Seminar, March 5, 2006
 University of Washington Special Seminar, February 23, 2006
 MPIM-Bonn Number Theory Seminar, August 17, 2005
 University of Durham, August 9, 2005
 MPIM-Bonn IMPRS Seminar, July 22, 2005
 Institut de Jussieu, July 4, 2005
 Università di Roma ("La Sapienza"), June 21, 2005
 Variations on Mahler Measure, CIRM-Luminy, May 31-June 4, 2005
 Antalya Algebra Days, May 17-23, 2005
 Bilkent University (3 talks), May 2005
 Purdue University Algebraic Geometry Seminar, November 17th, 2004
 University of Chicago Algebraic Geometry Seminar, November 10th, 2004
 University of Washington Algebra Seminar, November 2nd, 2004
 UCLA Perspectives in Mathematics Seminar, April 12th, 2004
 Fields Institute Weekend Seminar, March 27-28, 2004
 Lehigh University Math Department, February 12-13, 2004
 Ohio State University Math Department, February 4, 2004
 BIRS Workshop, Calabi-Yau Varieties and Mirror Symmetry, December 6-11, 2003
 Summer School on the Arithmetic, Geometry, and Topology of Algebraic Cycles,
 UNAM-Morelia (3 hour talks), June 15-July 4, 2003
 Conference on Web Theory and Differential Equations, CIRM-Luminy, March 31 -
 April 4, 2003
 University of Alberta Math Department, April 5, 2002
 Brown University Math Department, January 25, 2002
 Johns Hopkins Algebraic Geometry Seminar, January 24, 2002
 Summer School on Transcendental Aspects of Algebraic Cycles, Université de Grenoble,
 June 18-July 6, 2001

Teaching Experience:

Courses at WUSTL: taught Matrix Algebra, Hodge theory, Graduate Complex Analysis,
 Graduate Algebra, Calculus III; developed and taught Number Theory and Cryptography
 Alberta Science and Math Initiative (2 talks to high school students), Univ. of Alberta,
 July 2011 and August 2014
 Courses taught at Durham: Algebraic Geometry, Number Theory III/IV, Algebra and
 Number Theory II; ANT II and SMA (Calculus) tutorials
 Undergraduate Algebraic Geometry book (331 pp., on webpage) written for Fall 2009 -
 Spring 2010 class
 Supervised five Masters' theses (Project IV) at Durham (one co-supervised with
 H. Gangl); two were selected as best project in maths department (2008, 2009)
 Courses taught at Chicago: Basic Algebra I, Complex Analysis, Honors Calculus III,

Summer REU class on Algebraic Curves, Calculus II, Algebraic Curves.
Courses taught at UCLA (5/yr.): Finite Math, Calculus for Life Science,
Multivariable Calculus, Honors Linear Algebra, Analysis, Differential Geometry,
Game Theory; 10 lectures in graduate Hodge-theory seminar.
Advanced Linear Algebra book (192 pp., on webpage) written for Fall 2002 Honors class
Teaching Assistant, Princeton University Mathematics Department, 2000-2002

Advising:

Postdoctoral mentor for Ivan Horozov, Fall 2011-present
Current Ph.D. Students: Ryan Keast (5th year); Genival Francisco Fernandes da Silva Jr.,
Muxi Li, Yu Yang (3rd year); Tokio Sasaki (1st year)
Undergraduate research students: Thomas Morrell (senior thesis); Patrick Lopatto
(research project)
Masters' students at Durham: Stephanie Belcher, Andrew Strangeway, Thomas Oliver,
Adam Watts, Jason de Carvalho

Service:

Organizer of "Workshop on Hodge Theory and Representation Theory", Washington University,
St. Louis, April 25-29, 2015.
Co-Organizer (with R. Beheshti and M. Kumar): "Algebraic Cycles and Coherent Sheaves",
(AMS Central Sectional Meeting, St. Louis, Nov. 18-20)
Co-Organizer (with J. Lewis and G. Pearlstein): "Recent Advances in Hodge Theory: Period
Domains, Algebraic Cycles, and Arithmetic" (Vancouver, June 10-20, 2013)
Co-Organizer (with A. Clingher, C. Doran, and J. Walcher): "Hodge Theory and String Duality"
(Banff, Dec. 4-9, 2011)
Co-Organizer of WUSTL Algebraic Geometry Seminar; organized Kirk Lecture (2011);
Math Club supervisor, 2012-13 academic year; current Graduate Colloquium organizer
Chair, WUSTL Math. Dept. Postdoctoral Hiring Committee, 2010-11 academic year
Washington University Math Circle: Nov. 14, 2010; Oct. 2, 2011; Oct. 7, 2012; Feb. 9, 2014
Referee for papers submitted to American Journal of Mathematics, Journal of Number Theory,
Mathematical Research Letters, Journal of Algebraic Geometry, Advances in Theoretical and
Mathematical Physics, Nagoya Mathematical Journal, Journal of the London Math. Society,
Mathematische Annalen, Mathematische Zeitschrift, Manuscripta Math., Canadian Math.
Bulletin, Proceedings of the AMS, Communications in Number Theory and Physics,
Duke Math. Journal, Journal of K-theory, Selecta Mathematica, Advances in Math,
and proceedings volumes
NSF panelist and referee for three other funding bodies
Reviewer for AMS Mathscinet, including book review ("Mixed Hodge Theory" by C. Peters
and J. Steenbrink)
Co-Organizer (with V. Kurlin): Durham Univ. Pure Maths Colloquium, Fall 2008-Spring 2010
MAGIC Coordinator, Durham University, Fall 2009 - Spring 2010
Member of three Ph.D. committees (2 at WUSTL, 1 at Durham)
Principal Organizer: University of Chicago Algebraic Geometry Seminar, Winter-Spring 2007
Registered as Undergraduate and Graduate Mentor, National Alliance for Doctoral Studies
in the Mathematical Sciences