

## Aaron Bertram/CV

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### Education:

PhD Mathematics June, 1989 UCLA (Robert Lazarsfeld, Advisor)  
MA Mathematics December, 1985 UCLA  
BA Mathematics June, 1984 Harvard University

### Recognition:

Fellow of the American Mathematical Society (Awarded 2016)  
Distinguished Mentor, University of Utah (Awarded 2016)

### Positions Held:

7/00- present	Professor	University of Utah
7/12-6/13	Director	Math for America-Utah
7/05-6/11	Chair/Mathematics Department	University of Utah
8/00-11/00	Visiting Professor	University of Nice
7/95-6/00	Associate Professor	University of Utah
7/92-6/95	Assistant Professor	University of Utah
7/89-6/93	Benjamin Peirce Asst Professor	Harvard University
7/84-6/89	Teaching and Research Assistant	UCLA

### Grants:

7/17-6/20 NSF FRG Grant (with four Co PIs)  
7/16-6/21 Simons Travel Grant  
7/13-6/18 NSF Geometry RTG Grant (Co PI with Bromberg and deFernex)  
7/09-6/16 NSF Noyce Grant (with Hugo Rossi)  
7/09-6/14 NSF Research Grant  
7/06-6/12 NSF Departmental VIGRE Grant (Co PI with David Dobson)  
7/05-6/08 NSF Research Grant  
7/02-6/05 NSF Research Grant (Co PI with Herb Clemens)  
7/99-6/02 NSF Research Grant (Co PI with Herb Clemens)  
7/95-6/98 NSF Research Grant  
9/94-6/96 Sloan Research Fellowship  
7/92-6/95 NSF Research Grant  
9/89-6/92 NSF Postdoctoral Research Fellowship  
9/88-6/89 Sloan Doctoral Dissertation Research Fellowship

## Selected Publications

- *The tropical Nullstellensatz for congruences*, with R. Easton, Advances in Mathematics 308, (2017), 36-82.
  - *Some remarks on surface moduli and determinants*, Recent Advances in Algebraic Geometry 417, (2015), 13-28.
  - *The stability manifolds of  $\mathbf{P}^1$  and local  $\mathbf{P}^1$* , with S. Marcus and J. Wang, Hodge Theory and Classical Algebraic Geometry 647, (2015),
  - *Bridgeland stability conditions on threefolds II*, with A. Bayer, E. Macri and Y. Toda, Journal of Alg Geometry 23 (2014), 693-710.
  - *The birational geometry of moduli spaces of sheaves on the projective plane*, with C. Martinez and J. Wang, Geometriae Dedicata 173 (1), (2014), 37-64.
  - *The birational geometry of the Hilbert scheme of points on surfaces*, with I. Coskun, Birational Geometry, Rational curves, and Arithmetic, (2013), 15-55
  - *Polynomiality, wall crossings and Hurwitz cycles*, with R. Cavalieri and H. Markwig, Journal of Combinatorial Theory, Series A 120 (7), (2013), 1604-1631.
  - *The minimal model program for the Hilbert scheme of points on  $\mathbf{P}^2$*  with D. Arcara, I. Coskun, J. Huizenga, Advances in Math 235 (2013), 580-626.
  - *Bridgeland-stable moduli spaces for  $K$ -trivial surfaces*, with D. Arcara, J. of the Eur Math. Soc., Volume 15, Issue 1, (2013), 1-38
  - *Reider's theorem and Thaddeus pairs revisited*, with D. Arcara, Grassmannians, Moduli spaces and Vector Bundles 14, (2011), 51-68.
  - *Evaluating tautological classes using only Hurwitz numbers*, with R. Cavalieri and G. Todorov, Transactions of the AMS 360 (11), (2008), 6103-6111.
  - *Gromov Witten invariants for abelian and non-abelian quotients*, with I. Ciocan-Fontanine and B. Kim, Journal of Alg Geometry 17 (2008), 275-294.
  - *Computing Gromov-Witten invariants with algebraic geometry*, IAS/Park City Mathematics Series, Volume 11 (2006), 31-60.
  - *Two proofs of a conjecture of Hori and Vafa*, with I. Ciocan-Fontanine and B. Kim, Duke Math Journal, 126 1 (2005), 101-136.
  - *New recursions for genus-zero Gromov-Witten invariants*, with H.Kley, Topology 44 1 (2005).
  - *Stable maps and Gromov-Witten invariants*, Proceedings of the Workshop on Stacks and Moduli Spaces, ICTP Lecture Notes XIX (2004), 1-42.
  - *Using symmetry to count rational curves*, Symposium in Honor of C.H. Clemens, Contemporary Mathematics, 312 (2002), 87-99.
  - *On the quantum cohomology of a symmetric product of an algebraic curve*, with M. Thaddeus, Duke Mathematical Journal 108 (2), (2001), 329-362.
- The formula  $12 = 10+2 \times 1$ : Counting rational curves on  $\mathbf{F}^2$* , with D. Abramovich, Contemporary Mathematics 276, (2001) 83-88.

- *Another way to enumerate rational curves with torus actions*, Inventiones Mathematicae, **142** (2000) 487-512.
- *Some applications of localization to enumerative problems*, Michigan Math J, special edition for Bill Fulton, 48 (2000) 65-75.
- *Quantum multiplication of Schur polynomials*, with I. Ciocan-Fontanine and W. Fulton, Journal of Algebra **219** (1999) 727-746.
- *On stable rank two vector bundles with canonical determinant and many sections*, with B. Feinberg, Marcel-Dekker Lecture Notes **200** (1998), 259-270.
- *Quantum Schubert Calculus*, Advances in Math, **128** 2 (1997), 289-305.
- *Stable Pairs and Log Flips*, in AMS Proceedings of Symposium in Pure Math, 62, 1 (1997), 185-201.
- *Gromov invariants for Grassmannians*, with G. Daskalopoulos and R. Wentworth, Journal of the American Mathematical Society, **9** 2 (1996), 529-571.
- *Towards a Schubert calculus for maps from a Riemann surface to a Grassmannian*, International Journal of Math., **5** 6 (1994), 811-825.
- *Stable pairs and stable parabolic pairs*, Journal of Algebraic Geometry **3** (1994), 703-724.
- *Generalized  $SU(2)$  theta functions*, Inventiones Math 113 (1), (1993) 351-372.
- *Hilbert polynomials of moduli spaces of rank 2 vector bundles*, with A. Szenes, Topology **32** 3 (1993), 599-609.
- *Moduli of rank-2 vector bundles, theta divisors, and the geometry of curves in projective space*, Journal of Differential Geometry **35** (1992), 429-469.
- *Vanishing theorems, a theorem of Severi, and equations*, with L. Ein and R. Lazarsfeld, Journal of the American Mathematical Society **4** 3 (1991), 587-602.
- *Surjectivity of Gaussian maps*, with L. Ein and R. Lazarsfeld, Lecture Notes in Math **1479** (1991), 15-25..
- *An existence theorem for Prym special divisors*, Inventiones Math, 90 (3), (1987) 669-671.

### Volumes Edited.

- *Algebraic Geometry Summer Institute*, with D. Abramovich, L. Katzarkov, R. Pandharipande, M. Thaddeus, Proceedings of Symposia in Pure Mathematics 80 (2009), 1004 pages in two volumes.
- *Snowbird Lectures on String Geometry*, with K. Becker, M. Becker, P. Green, B. McKay, AMS Contemporary Mathematics 401 (2006).
- *Spring 2000 Symposium in Honor of C.H. Clemens*, with J. Carlson and H. Kley, AMS Contemporary Mathematics 312 (2002).

## Conferences Organized

The WAGS (Western Algebraic Geometry) Symposia.

- WAGS Symoisum (with A. Bayer and M. Hering), SLC, (2008)
- WAGS Symoisum (with de Fernex, Hacon and Lee), SLC, (2006)
- WAGS Symoisum (with C. Hacon and Y.P. Lee), SLC, (2005)
- WAGS Symoisum (with J. Fernandez), Salt Lake City, (2004)
- WAGS Symoisum/AMS Sectional, Salt Lake City, (2002)
- WAGS Symposium, Salt Lake City, (1999)
- UCLA-Utah-Chicago Conference, Salt Lake City, (1995).

AMS Summer Research Conferences

- **Derived Categories** (with Lee and Sharpe), Snowbird, Utah, (2007)
- **String Geometry** (Becker(s), P. Green, B. McKay) Snowbird, Utah, (2004).
- **Quantum Cohomology** (with Y. Ruan), Mt. Holyoke College, MA (1998).

Graduate Mini-Courses at the University of Utah

- **Derived Categories**, with YP Lee and E Sharpe (2007).
- **Motivic Integration**, with Chris Hacon (2005).

Other Conferences

- **AMS Summer Institute in Algebraic Geometry**, (with D. Abramovich, L. Katzarkov, R. Pandharipande, M. Thaddeus) Seattle, WA, July-August 2005.
- **Clemens Algebraic Geometry Weekend**, with J. Carlson and H. Kley, Salt Lake City, (2000).

## Teaching at the University of Utah

### High School Students

High School Summer Program in Mathematics  
High School Math Circles

### Undergraduate Teaching

Math 1030 Introduction to Quantitative Reasoning  
Math 1040 Introduction to Statistics and Probability  
Math 1210 Calculus I  
Math 1220 Calculus II  
Math 1250 AP Calculus I  
Math 1260 AP Calculus II  
Math 1310 Engineering Calculus I  
Math 2210 Calculus III  
Math 2270 Linear Algebra  
Math 3210 Foundations of Analysis I  
Math 4200 Introduction to Complex Variables  
Math 4400 Number Theory  
Math 4800 Undergraduate Research Topics  
Math 5310 Introduction to Modern Algebra I  
Math 5320 Introduction to Modern Algebra II  
Math 5405 Cryptography and Codes

### Teaching of Secondary School Teachers

Math 3100 Foundations of Geometry  
Math 4030 Foundations of Algebra  
Math 5270 Transformational Geometry  
Math 5900 Topics in Algebra  
Math 6080 Topics in Contemporary Math  
Teachers Math Circles and Masters Projects for Teachers  
Reading Courses and Project Work

### Graduate Teaching

Survival Skills for Graduate Students  
Math 6130 Introduction to Algebraic Geometry I  
Math 6140 Introduction to Algebraic Geometry II  
Math 6150 Complex Manifolds  
Math 6520 Introduction to Algebraic Topology  
Math 7800 Topics in Algebraic Geometry  
Reading Courses and Thesis Research in Algebraic Geometry

## Mentoring

### PhD Students Mentored

Henri Shahrouz. Harvard PhD 1995 (while I was a postdoc).

Thesis: *The Grothendieck Quot Scheme and Composition Laws*

Current Employment: Software Architect. NFL Enterprises.

Ionut Ciocan-Fontanine. Utah PhD 1996

Thesis: *The Quantum Cohomology Ring of Flag Varieties*

Current Employment: Professor. University of Minnesota.

Jian Kong. Utah PhD 2001

Thesis: Schubert Calculus on Flag Manifolds and Flag Bundles

Current Employment: Research Associate Scientist. Johns Hopkins.

Dragos Mustata. Utah PhD 2003

Thesis: Intermediate Moduli Spaces of Stable Maps

Current Employment: Lecturer. University College Cork, Ireland.

Renzo Cavalieri. Utah PhD 2005

Thesis: A Topological Quantum Field Theory for Admissible Covers

Current Employment: Associate Professor. Colorado State University.

Fumitoshi Sato. Utah PhD 2005

Thesis: Relations in the Tautological Ring Via Localization

Current Employment: Lecturer. Kagawa National College of Technology.

Gueorgui (Joro) Todorov. Utah PhD 2008

Thesis: Pluricanonical Maps for Threefolds

Current Employment: Quantitative Analyst. BlueCrest Capital.

Dylan Zwick. Utah PhD 2014

Thesis: Variations on a Theme of Symmetric Tropical Matrices

Current Employment: Director of Data Science, Overstock.com

Christian Martinez. Utah PhD 2015

Thesis: Stability Conditions and Birational Geometry

Current Employment: Assistant Professor (postdoc), UCSB

Drew Johnson. Utah PhD 2016

Thesis: Strange Duality and Tropical Geometry

Current Employment: Postdoc, University of Oregon

Thomas Goller. Utah PhD 2017

Thesis: Enumerative Geometry of Curves and Surfaces

Current Employment: Postdoc, KIAS (Korea Institute of Advanced Science)

### **Postdocs Mentored**

Holger Kley (1997-2000) Assistant Professor/Lecturer  
Current Employment: Manager. Spirae.

Prakash Belkale (1999-2002) Wylie Assistant Professor/Lecturer  
Current Employment: Professor. University of North Carolina.

Daniele Arcara (2003-2006) Assistant Professor/Lecturer  
Current Employment: Chair and Associate Professor. Saint Vincent College.

Arend Bayer (2006-2008) Wylie Assistant Professor/Lecturer  
Current Employment: Lecturer. University of Edinburgh.

Emanuele Macri (2008-2011) Wylie Assistant Professor/Lecturer  
Current Employment: Associate Professor. Northeastern University.

Steffen Marcus (2011-2014) Burgess Assistant Professor/Lecturer  
Current Employment: Assistant Professor. The College of New Jersey.

Nicola Tarasca (2013-2016) Assistant Professor/Lecturer  
Current Employment: Postdoc, University of Georgia

Brooke Ullery (2015-16) NSF Postdoctoral Scholar  
Current Employment: Postdoc, Harvard University

Katrina Honigs (2015-) NSF Postdoctoral Scholar and Wylie Instructor  
Bronson Lim (2017-)- RTG Postdoc

### **Undergraduates Mentored (Research Projects)**

Drew Ellingson (2014-2015) (COS Undergraduate Research Award)  
Project: Tropical Theta Characteristics

Hunter Simper (2015-2016)  
Project: Tropical Plane Curves with Many Singularities

Dietrich Geisler (2015-2017)  
Project: Lie Algebras

Oliver Richardson (2016-17)  
Project: Tropical Trigonal Curves

### **Masters Projects (Secondary School Teachers).**

Nate Nelson (2016-17). *Quaternions and Octonions.*

Kiersten Thorsen and Angela Price (2016-17). *Generalized Spirographs.*

Camilla Strong (2015-16). *Elliptic Curves.*

Vivian Shell (2014-15). *The Real Projective Plane.*

Nordin and Okamura (2014-15). *Ciphers and Cryptography.*

Lissett Sierra (2014-15). *The Rubik's Cube.*

Shinil Kang (2014-15). *The Euclidean Solids.*

Eric Schober (2013-14). *The Complex Circle.*

Chris Sheffield (2013-14). *Quadratic Reciprocity.*

Jessica Millar (2012-13). *Quadratic Functions in Math and Physics.*

## Recent Service

### **Mathematics Department Committees**

**2015-2016** Hiring Committee

**2013-2015** Executive Committee

**2012-2013** Chair of the Tenure-Track/Tenured Hiring Committee

**2005-2011** Chair of the Mathematics Department.

**2004-2005** Tenure-Track/Tenured Hiring Committee  
Vision and Strategic Planning Committee  
Outstanding Student and Instructor Awards  
Mathematics Education Committee

**2003-2004** Executive Committee  
Graduate Admissions Committee  
Mathematics Education Committee

**2002-2003** Executive Committee  
Graduate Recruitment and Admissions Committee  
Mathematics Education Committee

### **College of Science Committees**

**2014-2018** College RPT Committee

**2012-2013** Director, Math for America Utah

**2011-2013** Center for Science and Math Education Steering Committee

**2011-2012** George Thomas Building Educational Planning Committee

**2003-2005** College of Science Council

### **University of Utah Committees**

- College of Education Tenure Hiring Committee(s) 2015-17.
- University of Utah Teaching Committees
- University of Utah Research Committees
- Internal Reviewer for Graduate Programs

### **External Service**

**2009-2011** Member-at-Large, Council of the American Mathematical Society

**2006-2012** Steering Committee for the Park City Mathematics Institute

**2005-2007** Governor Huntsman's Math advisory board.