

Karl Schwede

CONTACT INFORMATION	Department of Mathematics The University of Utah 155 S 1400 E Room 233, Salt Lake City, UT 84112-0090	office: JWB 315 email: schwede@math.utah.edu web: http://www.math.utah.edu/~schwede/
RESEARCH INTERESTS	I do basic research in mathematics, studying algebra, geometry and particularly singularities. Much of my work is in the setting of modular arithmetic (also known as clock arithmetic), the same setting as much of our modern communication systems. Within mathematics, I work on the boundary of the fields algebraic geometry and commutative algebra. I am also interested in number theory and computational algebra.	
EDUCATION	University of Washington , Seattle, WA <i>Ph.D., Mathematics</i> <ul style="list-style-type: none">• Advisor: Sándor Kovács• Dissertation: On F-injective and Du Bois singularities Whitman College , Walla Walla, WA <i>B.A., Mathematics (Honors)</i> <ul style="list-style-type: none">• Minor: Computer Science• Magna Cum Laude Bellevue Community College , Bellevue, WA <i>Associate in Arts and Sciences</i>	August 2006 June 1999 June 1997
PROFESSIONAL EXPERIENCE	The University of Utah , Salt Lake City, UT <i>Professor</i> <i>Associate Professor</i> The Pennsylvania State University , State College, PA <i>Assistant Professor</i> MSRI , Berkeley CA <i>Research Member</i> <i>Research Member</i> <i>Research Member</i> University of Utah , Salt Lake City, UT <i>Visiting Assistant Professor</i> Johannes Gutenberg University Mainz , Mainz Germany <i>Honorary Visiting Assistant Professor</i> University of Michigan , Ann Arbor, MI <i>NSF Postdoc / Postdoctoral Assistant Professor</i> University of Washington , Seattle WA <i>Teaching Assistant and Instructor</i> Havas Interactive (division of Vivendi) , Walla Walla WA <i>Computer Programmer</i> developing educational software	Jul. 2018–present Jul. 2014–Jun. 2018 Jan. 2011–Jun. 2014 Jan.–Mar. 2009 Apr.–May 2013 Apr.–May 2019 Fall 2010 Jun. 2010 Sep. 2006–Jul. 2010 Sep. 2000–Aug. 2006 May 1999–Aug. 2000

AWARDS &
FUNDING

PI – NSF, <i>A Unified Perspective on Singularities in Commutative Algebra and Algebraic Geometry</i> , DMS # 2101800, \$412,334.00.	Sept 2021– Aug 2025
American Mathematical Society, <i>Fellow of the AMS</i> .	Nov. 2020– present
Simons Foundation, <i>Simons Fellow in Mathematics</i> .	Sep. 2020– May 2021
co-PI – NSF, <i>FRG: Collaborative Research: Algebraic Geometry and Singularities in Positive and Mixed Characteristic</i> , DMS #1952522, \$401,245.00.	Jun. 2020– May 2023
PI – NSF, <i>RTG: Algebra, Geometry, and Topology at the University of Utah</i> , DMS #1840190, \$2,492,843.00.	June 2019– May 2024
PI – NSF, <i>Commutative Algebra: Singularities in All Characteristics with Geometric Applications</i> , DMS #1801849, \$182,000.00.	Sep. 2018– Aug. 2021
University of Utah, <i>Presidential Scholar</i> .	Sep. 2017– Aug. 2020
PI – NSF, <i>CAREER: Test Ideals and the Geometry of Projective Varieties in Positive Characteristic</i> , DMS # 1252860/1501102, \$442,615.00.	Sep. 2013– Aug. 2019
PI – NSF, <i>FRG: Collaborative Research: Birational Geometry and Singularities in Zero and Positive Characteristic</i> , DMS #1265261/1501115, \$229,061.00.	July 2013– June 2017
co-PI – NSF, for conference <i>Macaulay2 Development workshop</i> , DMS # 1601205.	May 2016– April 2017
Alfred P. Sloan Foundation, <i>Alfred P. Sloan Research Fellowship</i> .	Sept. 2012– Sept. 2016
co-PI – NSF, for conference <i>Computational Workshop on Singularities and Invariants Defined by Frobenius</i> , DMS # 1160927, \$10,000.00	May 2012
PI – NSF, <i>Singularities in Characteristic Zero and Singularities in Positive Characteristic</i> , DMS # 0969145/1064485, \$105,420.00.	Sept. 2010– Aug. 2013
PI then co-PI – NSF, for conference <i>Frobenius splitting in algebraic geometry, commutative algebra, and representation theory</i> , DMS # 0968646, \$25,000.00.	May 2010
PI – NSF, Postdoctoral Fellowship, DMS # 0703505, \$108,000.00.	Sept. 2007– Aug. 2010

PUBLICATIONS
All have been
refereed

1. *Gluing Schemes and a Scheme Without Closed Points*. Recent progress in arithmetic and algebraic geometry, 157–172, Contemp. Math. 386. 2005
2. *A simple characterization of Du Bois singularities*. Compos. Math. 143, no. 4, 813–828. 2007
3. *Rational singularities associated to pairs*, with S. Takagi. Michigan Math. J. 57, 625–658. 2008
4. *Generalized test ideals, sharp F -purity, and sharp test elements*. Math. Res. Lett. 15, no. 6, 1251–1261. 2008
5. *F -injective singularities are Du Bois*. Amer. J. Math. 131, no. 2, 445–473. 2009
6. *F -adjunction*. Algebra & Number Theory. 3, no. 8, 907–950. 2009
7. *The canonical sheaf of Du Bois singularities*, with S. Kovács and K. Smith. Adv. Math. 224, no. 4, 1618–1640. 2010
8. *Globally F -regular and log Fano varieties*, with K. Smith. Adv. Math. 224, no. 3, 863–894. 2010
9. *A refinement of sharply F -pure and strongly F -regular pairs*. Journal of Commutative Algebra, 2, no. 1, 91–110, 2010
10. *Centers of F -purity*. Math. Z. 265, no. 3, 687–714. 2010
11. *Discreteness and rationality of F -jumping numbers on rings with singularities*, with M. Blickle, S. Takagi and W. Zhang. Math. Ann., 347, no. 4, 917–949. 2010.
12. *On the number of compatibly Frobenius split subvarieties, prime F -ideals, and log canonical centers*, with K. Tucker. Ann. Inst. Fourier (Grenoble) **60** (2010), no. 5, 1515–1531.
13. *Hodge theory meets the minimal model program: a survey of log canonical and Du Bois singularities*, with S. Kovács. Topology of Stratified Spaces (G. Friedman, E. Hunsicker, A. Libgober, and L. Maxim, eds.), Math. Sci. Res. Inst. Publ., vol. 58, Cambridge Univ. Press, Cambridge, 2011, pp. 51–94.
14. *Test ideals in non- \mathbb{Q} -Gorenstein rings*, Trans. Amer. Math. Soc. **363** (2011), no. 11, 5925–5941
15. *A note on discreteness of F -jumping numbers*. Proc. Amer. Math. Soc. **139** (2011), no. 11, 3895–3901
16. *Supplements to non-LC ideal sheaves*, with O. Fujino and S. Takagi. Higher Dimensional Algebraic Geometry, RIMS Kôkyûroku Bessatsu, B24, Res. Inst. Math. Sci. (RIMS), Kyoto, 2011, pp. 1–47.
17. *Semi-log canonical vs F -pure singularities*, with L. E. Miller. J. Alg. **349**, (2012), no. 1, 150–164.
18. *On the behavior of test ideals under finite morphisms*, with K. Tucker. J. Algebraic Geom. 23 (2014), no. 3, 399–443.
19. *Test ideals via a single alteration and discreteness and rationality of F -jumping numbers*, with K. Tucker and W. Zhang. Math. Res. Lett. 19, (2012), no. 01, 191–197.

Publications are continued on the next page.

PUBLICATIONS
CONTINUED
All have been
refereed

20. *A survey of test ideals*, with K. Tucker. *Progress in Commutative Algebra 2, Closures, Finiteness and Factorization*, Walter de Gruyter GmbH & Co. KG, Berlin, (2012), 39–99.
21. *An algorithm for computing compatibly Frobenius split subvarieties*, with M. Katzman. *J. Symbolic Comput.*, **47**, (2012), no. 8, 996–1008.
22. *Cartier modules on toric varieties*, with J.-C. Hsiao, and W. Zhang. *Trans. Amer. Math. Soc.* 366 (2014), no. 4, 1773–1795.
23. *Du Bois singularities deform*, with S. Kovács. in *Minimal Models and Extremal Rays (Kyoto, 2011)*, *Adv. Stud. Pure Math.* (2016), 70, 49–66.
24. *A canonical linear system associated to adjoint divisors in characteristic $p > 0$* . *J. Reine Angew. Math.* 696 (2014), 69–87.
25. *p^{-1} -linear maps in algebra and geometry*, with M. Blickle. *Commutative Algebra, Expository Papers Dedicated to David Eisenbud on the Occasion of His 65th Birthday* (I. Peeva ed.), Springer New York Heidelberg Dordrecht London, 2013, pp. 123–205.
26. *F -signature of pairs and the asymptotic behavior of Frobenius splittings*, with M. Blickle and K. Tucker. *Adv. Math.* **231**, (2012) no. 6, 3232–3258.
27. *F -signature of pairs: Continuity, p -fractals and minimal log discrepancies*, with M. Blickle and K. Tucker. *J. London Math. Soc.* **87** (2013), no. 3, 802–818.
28. *Richardson varieties have Kawamata log terminal singularities*, with S. Kumar. *Int. Math. Res. Not. IMRN* 2014, no. 3, 842–864.
29. *Bertini theorems for F -singularities*, with W. Zhang. *Proc. Lond. Math. Soc.* (3) 107 (2013), no. 4, 851–874.
30. *A dual to tight closure theory*, with N. Epstein. *Nagoya Math. J.* 213 (2014), 41–75.
31. *Depth of F -singularities and base change of relative canonical sheaves*, with Z. Patakfalvi. *Journal of the Institute of Mathematics of Jussieu.* **13**, no. 1, (2014) 43–63.
32. *On the numerical dimension of pseudo-effective divisors in positive characteristic*, with P. Cascini, C. Hacon and M. Mustața. *Amer. J. Math.* 136 (2014), no. 6, 1609–1628.
33. *Appendix: F -injectivity and depth*, with A. K. Singh. Appendix to *Deformations of F -injectivity and local cohomology* by J. Horiuchi, L. E. Miller and K. Shimomoto. *Indiana Univ. Math. J.* 63 (2014), no. 4, 1139–1157.
34. *A Frobenius variant of Seshadri constants*, with M. Mustața. *Math. Ann.* 358 (2014), no. 3–4, 861–878.
35. *Explicitly extending Frobenius splittings over finite maps*, with K. Tucker. *Comm. Algebra* 43 (2015), no. 10, 4070–4079.
36. *Rings of Frobenius operators*, with M. Katzman, A. K. Singh and W. Zhang. *Math. Proc. Cambridge Philos. Soc.* 157 (2014), no. 1, 151–167.

Publications are continued on the next page.

PUBLICATIONS
CONTINUED
All have been
refereed

37. *Test ideals of non-principal ideals: Computations, Jumping Numbers, Alterations and Division Theorems*, with K. Tucker. *J. Math. Pures Appl.* (9) 102 (2014), no. 5, 891–929.
38. *F-singularities via alterations*, with M. Blickle and K. Tucker. *Amer. J. Math.* 137 (2015), no. 1, 61–109.
39. *The weak ordinarity conjecture and F-singularities*, with B. Bhatt and S. Takagi. *Adv. Stud. Pure Math.*, 74, Math. Soc. Japan, Tokyo, 2017.
40. *Uniform bounds for strongly F-regular surfaces*, with Paolo Cascini and Yoshi-nori Gongyo. *Trans. Amer. Math. Soc.* 368 (2016), no. 8, 5547–5563.
41. *On rational connectedness of globally F-regular threefolds*, with Y. Gongyo, Z. Li, Z. Patakfalvi, H. Tanaka, and R. Zong. *Adv. Math.* 280 (2015), 47–78.
42. *Inversion of adjunction for rational and Du Bois pairs*, with S. Kovács. *Algebra & Number Theory.* 10 (2016), no. 5, 969–1000.
43. *Test ideals in rings with finitely generated anti-canonical algebras*, with A. Chieccchio, F. Enescu and L. E. Miller. *J. Inst. Math. Jussieu* 17 (2018), no. 1, 171–206.
44. *The F-different and a canonical bundle formula*, with O. Das. *Ann. Sc. Norm. Super. Pisa Cl. Sci.* 17 (2017), no 3, 1173–1205
45. *F-singularities in families*, with Z. Patakfalvi and W. Zhang. *Algebr. Geom.* 5 (2018), no. 3, 264–327.
46. *Positive characteristic algebraic geometry*, with Z. Patakfalvi and K. Tucker. *Surveys on recent developments in algebraic geometry*, 33–80, *Proc. Sympos. Pure Math.*, 95, Amer. Math. Soc., Providence, RI, 2017.
47. *On the behavior of singularities at the F-pure threshold*, with E. Canton, D. Hernández and E. Witt. Appendix by Alessandro De Stefani, Jack Jeffries, Zhibek Kadyrsizova, Robert Walker, George Whelan. *Illinois J. Math.* 60 (2016), no. 3–4, 669–685.
48. *The dualizing complex of F-injective and Du Bois singularities*, with B. Bhatt and L. Ma. *Math. Z.* 288 (2018), no. 3–4, 1143–1155.
49. *Discreteness of F-jumping numbers at isolated non-Q-Gorenstein points*, with P. Graf. *Proc. Amer. Math. Soc.* 146 (2018), no. 2, 473–487.
50. *Local cohomology of Du Bois singularities and applications to families.*, with L. Ma and K. Shimomoto. *Compos. Math.* 153 (2017), no. 10, 2147–2170.
51. *Fundamental groups of F-regular singularities via F-signature*, with J. Carvajal-Rojas and K. Tucker. *Ann. Sci. Éc. Norm. Supér.* (4) 51 (2018), no. 4, 993–1016.
52. *Étale fundamental groups of strongly F-regular schemes*, with B. Bhatt, J. Carvajal-Rojas, P. Graf and K. Tucker. *Int. Math. Res. Not. IMRN* 2019, no. 14, 4325–4339.
53. *Divisor package for Macaulay2*, with Z. Yang. *J. Softw. Algebra Geom.* 8 (2018), 87–94.

Publications are continued on the next page.

PUBLICATIONS
CONTINUED
*All have been
refereed*

54. *Perfectoid multiplier/test ideals in regular rings and bounds on symbolic powers*, with L. Ma. *Invent. Math.* 214 (2018), no. 2, 913–955.
55. *F-signature under birational morphisms*, with L. Ma., T. Polstra, K. Tucker. *Forum Math. Sigma* 7 (2019), e11.
56. *The TestIdeals package for Macaulay2*, with A. F. Boix, D. J. Hernández, Z Kadyrsizova, M. Katzman, S. Malec, M. Robinson, D. Smolkin, P. Teixeira, E. E. Witt. *J. Softw. Algebra Geom.* 9 (2019), no. 2, 89–110.
57. *Recent applications of p-adic methods to commutative algebra*, with L. Ma. *Notices Amer. Math. Soc.* 66 (2019), no. 6, 820–831.
58. *Seminormalization package for Macaulay2*, with B. Serbinowski. *J. Softw. Algebra Geom.* 10 (2020), no. 1, 1–7.
59. *A Kunz-type characterization of regular rings via alterations*, with L. Ma. *J. Pure Appl. Algebra* 224 (2020), no. 3, 1124–1131.
60. *Singularities in mixed characteristic via Perfectoid big Cohen-Macaulay algebras*, with L. Ma. *Duke Math. J.* 170 (2021), no. 13, 2815–2890.
61. *The FrobeniusThresholds package for Macaulay2*, with D. J. Hernández, P. Teixeira, E. E. Witt. *J. Softw. Algebra Geom.* 11 (2021), no. 1, 25–39.
62. *Bertini Theorems for F-signature*, with J. Carvajal-Rojas and K. Tucker. *Math. Z.* 299 (2021), no. 1-2, 1131–1153.
63. *Covers of rational double points in mixed characteristic*, with J. Carvajal-Rojas, L. Ma, T. Polstra, K. Tucker. *Covers of rational double points in mixed characteristic. J. Singul.* 23 (2021), 127–150.
64. *Maximal Cohen-Macaulay complexes and their uses: A partial survey*, with S. Iyengar, L. Ma, M. Walker. [arXiv:2106.08173](https://arxiv.org/abs/2106.08173). *Commutative algebra*, 475–500, Springer, Cham, (2021).
65. *An analog of adjoint ideals and PLT singularities in mixed characteristic*, with L. Ma, K. Tucker, J. Waldron, J. Witaszek. *J. Algebraic Geom.* 31 (2022), no. 3, 399–443.

ACCEPTED
PAPERS

66. *Symbolic power containments in singular rings in positive characteristic*, with E. Grifo and L. Ma. [arXiv:1911.06307](https://arxiv.org/abs/1911.06307). To appear in *Manuscripta Mathematica*.
67. *RationalMaps, a package for Macaulay2*, with C.J. Bott, S. H. Hassanzadeh, D. Smolkin. [arXiv:1908.04337](https://arxiv.org/abs/1908.04337). To appear in *J. Softw. Algebra Geom.*
68. *Compatible ideals in Gorenstein rings*, with T. Polstra. [arXiv:2007.13810](https://arxiv.org/abs/2007.13810). To appear in *Proc. Amer. Math. Soc.*

SUBMITTED
PAPERS
/PREPRINTS

69. *FastMinors package for Macaulay2*, with B. Martinova, M. Robinson, Y. Yao. [arXiv:2002.05758](https://arxiv.org/abs/2002.05758).
70. *Globally $+$ -regular varieties and the minimal model program for threefolds in mixed characteristic*, with B. Bhatt, L. Ma, Z. Patakfalvi, K. Tucker, J. Waldron, J. Witaszek. [arXiv:2012.15801](https://arxiv.org/abs/2012.15801).
71. *RandomPoints package for Macaulay2*, with Sankhaneel Bisui, Sarasij Maitra, Thái Thành Nguyễn. [arXiv:2101.09573](https://arxiv.org/abs/2101.09573).
72. *Global generation of test ideals in mixed characteristic and applications*, with Christopher Hacon, Alicia Lamarche. [arXiv:2106.14329](https://arxiv.org/abs/2106.14329).
73. *Perfectoid signature, perfectoid Hilbert-Kunz multiplicity, and an application to local fundamental groups*, with H. Cai, S. Lee, L. Ma, K. Tucker. [arXiv:2209.04046](https://arxiv.org/abs/2209.04046).

SOFTWARE

- RandomPoints package for Macaulay2, a package for finding rational and geometric points on varieties over finite fields. Joint with Sankhaneel Bisui, Sarasij Maitra, Thai Nguyen, Zhan Jiang. The latest stable version of RandomRationalPoints is part of the Macaulay2 build tree:
<https://github.com/Macaulay2/M2> **2020–present**
- LazyPowerSeries package for Macaulay2, a package for studying power series and p -adic rings in positive characteristic. Joint with Annie Giokas. The current version is available here:
<https://github.com/annie-giokas/M2PowerSeries> **2022–present**
- FastMinors package for Macaulay2, a package faster function field linear algebra and especially computing ideals of minors in Macaulay2 (with applications to determining singularities). Joint with Boyana Martinova, Marcus Robinson, Yuhui (Wei) Yao. The latest stable version of FastLinAlg is part of the Macaulay2 build tree:
<https://github.com/Macaulay2/M2>
The bleeding edge version is available at:
<https://github.com/kschwede/M2/blob/master/M2/Macaulay2/packages/> **2019–present**
- RationalMaps package for Macaulay2, a package for checking whether a rational map is birational/regular/an embedding. Joint with C.J. Bott, Hamid Hassanzadeh, and Dan Smolkin. The current version is in the Macaulay2 build tree:
<https://github.com/Macaulay2/M2/tree/master/M2/Macaulay2/packages> **2016–present**

Software is continued on the next page.

SOFTWARE
CONTINUED

- Seminormalization package for Macaulay2, a package for computing seminormalizations. Joint with Bernard Serbinowski. The current version is in the Macaulay2 build tree:
<https://github.com/Macaulay2/M2/tree/master/M2/Macaulay2/packages> **2018–present**
- Pullback package for Macaulay2, a package for computing pullbacks in the category of rings. Joint with Drew Ellingson. It is part of the current Macaulay2 build tree:
<https://github.com/Macaulay2/M2/tree/master/M2/Macaulay2/packages> **2015–present**
- Divisor package for Macaulay2, a package for computations with Weil divisors on normal varieties. Joint with Zhaoning Yang. It is part of the current Macaulay2 build tree:
<https://github.com/Macaulay2/M2/tree/master/M2/Macaulay2/packages> **2014–present**
- Macaulay2 function for computing compatibly split subvarieties, joint with Mordechai Katzman. Download the current version:
<http://www.math.utah.edu/~schwede/M2/FSplitting.m2> **2012–present**
- TestIdeals package for Macaulay2, a package for computing F -singularities (test ideals, F -rationality, etc.). Joint with Erin Bela, Alberto F. Boix, Juliette Bruce, Daniel Hernandez, Zhibek Kadyrsizova, Mordechai Katzman, Sara Malec, Marcus Robinson, Daniel Smolkin, Pedro Teixeira and Emily Witt. The latest stable version of TestIdeals is part of the Macaulay2 build tree:
<https://github.com/Macaulay2/M2>
The bleeding edge version and related packages are in:
<https://github.com/kschwede/Workshop-2017-Berkeley/tree/master/Fsing/> **2012–present**
- FrobeniusThresholds package for Macaulay2, a package for computing F -thresholds and related invariants. Joint with Juliette Bruce, Daniel Hernandez, Daniel Smolkin, Pedro Teixeira and Emily Witt. The latest stable version of FrobeniusThresholds is part of the Macaulay2 build tree:
<https://github.com/Macaulay2/M2>
The bleeding edge version and related packages are in:
<https://github.com/kschwede/Workshop-2017-Berkeley/tree/master/Fsing/> **2018–present**

ORGANIZATIONAL ACTIVITIES	<ul style="list-style-type: none"> • Lead organizer for the workshop <i>Recent Developments in Commutative Algebra</i>, to be held in MSRI During the special Commutative Algebra Semester 	April 2024
	<ul style="list-style-type: none"> • On the organizing committee of <i>The Fellowship of the Ring</i>, national commutative algebra online seminar. https://sites.google.com/view/fellowship-of-the-ring 	April 2020 – present
	<ul style="list-style-type: none"> • A member of the Western Algebraic Geometry Symposium (WAGS) Council, the body that oversees this semi-annual conference. https://sites.google.com/a/wagsymposium.org/ 	2021 – present
	<ul style="list-style-type: none"> • Co-organizer of an AMS Special Session, held at the University of Utah 	Oct. 2022
	<ul style="list-style-type: none"> • Co-organizer of the conference: <i>Advances in Mixed Characteristic Commutative Algebra and Geometric Connections</i>, at Oaxaca (BIRS) 	May 2022
	<ul style="list-style-type: none"> • Co-organizer of the virtual special month on Singularities and K-stability at the University of Utah, https://sites.google.com/view/special-month-on-singularities 	May 2021 – June 2021
	<ul style="list-style-type: none"> • Co-organizer of an AMS Special Session, held at the University of Michigan 	Oct. 2018
	<ul style="list-style-type: none"> • Co-organizer of an AMS Special Session, held at Portland State University 	Apr. 2018
	<ul style="list-style-type: none"> • Co-organizer of an AMS Special Session, held that the Joint Mathematics Meetings in San Diego 	Jan. 2018
	<ul style="list-style-type: none"> • Co-organizer of the conference: <i>Higher dimensional algebraic geometry and characteristic $p > 0$</i>, held at CIRM / Luminy 	Sept. 2016
	<ul style="list-style-type: none"> • Co-organizer of the summer school and conference: <i>Higher Dimensional Algebraic Geometry</i> held at University of Utah 	Jul. 2016
	<ul style="list-style-type: none"> • Co-organizer of the workshop: <i>Intensive Workshop for Macaulay2 Development</i>, held at the University of Utah 	May 2016
	<ul style="list-style-type: none"> • Co-organizer of the AMS special session: <i>Algebraic Geometry</i>, held at the University of Utah 	Apr. 2016
	<ul style="list-style-type: none"> • Co-organizer of the AMS-AWM special session: <i>Commutative Algebra and Its Interactions with Algebraic Geometry</i>, held at the Joint Mathematical Meetings 	Jan. 2016
	<ul style="list-style-type: none"> • Co-organizer of the <i>Mathematical Research Communities Workshop on Commutative Algebra</i> held at Snowbird Utah 	June 2015
	<ul style="list-style-type: none"> • Co-organizer of the <i>Positive Characteristic Algebraic Geometry Workshop</i> held at the University of Illinois at Chicago 	March 2014
	<ul style="list-style-type: none"> • Co-organizer of the AMS special session: <i>Homological and characteristic p methods in commutative algebra</i>, held at the Joint Mathematical Meetings, Baltimore 	January 2014

Organizational activities are continued on the next page.

ORGANIZATIONAL ACTIVITIES CONTINUED	<ul style="list-style-type: none"> • Co-organizer of the AMS special session: <i>Special Session on The Geometry of Algebraic Varieties</i>, held at Temple University October 2013 • Organizer/co-organizer of the Penn State algebra and number theory seminar. 2013-2014 • Co-organizer of a mini-symposium at: <i>SIAM conference on Applied Algebraic Geometry</i>, held at Colorado State University August 2013 • Co-organizer of the conference: <i>Computational workshop on Frobenius singularities and invariants</i>, held at the University of Michigan, see http://sites.google.com/site/computinginvariantstorkshop/ May 2012 • Co-organizer of the AMS Special Session: <i>Singularities in Commutative Algebra and Algebraic Geometry</i>, held at the University of Kansas March 2012 • Co-organizer of the conference: <i>Relating test ideals and multiplier ideals</i>, held at the American Institute of Mathematics August 2011 • Co-organizer of the conference: <i>Frobenius splitting in algebraic geometry, commutative algebra, and representation theory</i>, see http://sites.google.com/site/frobeniussplitting/ May 2010 • Assistant to the organizers of <i>Commutative algebra</i> AMS MRC summer conference/school in Snowbird Utah June 2010 • Organizer/co-organizer of the University of Michigan commutative algebra seminar. 2008–2010 • Local organizer for Mel Hochster’s 65th birthday conference. August 2008 • Organizer/co-organizer of the University of Michigan topics in algebraic geometry seminar. 2007–2008 • Organizer of the University of Washington algebraic geometry seminar. 2004–2005 • Co-organizer of the University of Washington undergraduate mathematical sciences seminar 2004–2005
OTHER PROFESSIONAL ACTIVITIES	<ul style="list-style-type: none"> • Editor for the journal <i>Épjournal de Géométrie Algébrique</i>. https://epiga.episciences.org/ 2021–present • Series Editor for the RSME Springer Series. http://www.springer.com/series/13759 2015–present • Special Assistant to the Dean of the College of Science, University of Utah. 2020–2022 • Director of Graduate Studies, University of Utah. 2015–2017

Professional activities are continued on the next page.

OTHER
PROFESSIONAL
ACTIVITIES
CONTINUED

- Member of the following committees at the University of Utah:
 - Ad Hoc Career Line Faculty Review Committee, Mathematics Department **2022–present**
 - Executive Committee, Mathematics Department **2022–present**
 - Senate IT Committee (SACIT) **2021–present**
 - Hiring committee. **2021–2022**
 - Mathematics EDI committee. **2021–2022**
 - College of Science EDI committee. **2021–2022**
 - Graduate Recruitment Committee. **2014–2017, 2019**
 - Graduate Committee. **2014–2017**
 - Outstanding Graduate Student & Instructor Award Committee. **2015–2017**
 - Outstanding dissertation award committee (Graduate School) **Summer 2016**
 - Ad hoc committee on thesis formatting (Graduate School) **2016–2019**
 - University TAs hip award committee (Graduate School) **Spring 2017**
 - Executive Committee, Mathematics Department **2017–2019**
 - Bachelor of Undergraduate Studies (BUS) Committee **2018–2020**
 - Departmental Thesis Standards Committee **2018–2020**
- Member of the following committees at Penn State: Qualifying Exam Committee, Graduate Student Teaching Committee, Library Committee, Eberly College Outreach Council. **2011–2014**
- Ran a 3-week long math camp for high school students, *Explorations in Number Theory and Cryptography*, University of Utah **June 2016**
- Ran a week-long math camp for high school students, *Spy Games: the math of secret messages*, within Penn State’s *Science-U* camp program. **June 2013 and July 2014**
- Helped build and maintain *Situs Geometriae Algebraicae*, a website designed to help students in algebraic geometry find references. **2004–2008**
- Active participant on <http://www.mathoverflow.net>. **2010–present**
- Reviewed papers for AMS Math Reviews and Zentralblatt Math. **2006–present**
- Helped develop the University of Washington VIGRE website. **2002–2003**
- Panelist for NSF grant applications (Standard Grants, CAREER Grants, GRF grants, Postdoctoral Fellowships) **Various years**
- Referee for NSA grant applications. **Various years**
- Referee for Simons Foundation grant applications. **Various years**
- Referee for grant/fellowship applications from other institutions/foundations (ERC/DFG/etc.). **Various years**

REFEREED &
REVIEWED
PAPERS FOR
THE JOURNALS:

Journal of the American Mathematical Society, Forum of Math: Pi & Sigma, Annales Scientifiques de l'École Normale Supérieure, American Journal of Mathematics, Inventiones Mathematica, Duke Mathematical Journal, Journal of the European Mathematical Society, Advances in Mathematics, Journal of Algebraic Geometry, Compositio Mathematica, Mathematische Annalen, Journal für die reine und angewandte Mathematik, Algebraic Geometry, Transactions of the American Mathematical Society, Mathematical Research Letters, International Mathematics Research Notices, Proceedings of the American Mathematical Society, Mathematische Zeitschrift, Discrete Math, Israel Journal of Mathematics, Journal of Symbolic Computation, Scuola Normale Superiore (Annali di Scienze), the Illinois Journal of Mathematics, Algebra and Number Theory, the Journal of Algebra, Journal of Pure and Applied Algebra, Annales de l'institut Fourier, Communications in Algebra, Journal of Commutative Algebra, the Michigan Mathematical Journal, AMS Contemporary Mathematics, Pure and Applied Mathematics Quarterly, Manuscripta Mathematica, Central European Mathematics Journal, Canadian Journal of Mathematics, Nagoya Mathematical Journal, Journal of the London Mathematical Society, the Kyoto Journal of Mathematics, American Mathematical Monthly, Periodica Mathematica Hungarica, Mathematical Proceedings of the Cambridge Philosophical Society, miscellaneous proceedings volumes.

TEACHING

Instructor: I have been an instructor for:

- high school level algebra, University of Washington.
- precalculus, University of Washington.
- calculus, University of Washington, University of Michigan, University of Utah.
- multivariable calculus, University of Washington.
- topology, University of Washington.
- linear algebra, University of Michigan.
- honors calculus (essentially introduction to real analysis), University of Michigan.
- introduction to topology, University of Washington.
- introduction to schemes and cohomology, University of Michigan..
- topics course on algebraic geometry and commutative algebra, University of Utah.
- undergraduate abstract algebra, Penn State University & University of Utah.
- graduate-level commutative algebra, Penn State University & University of Utah.
- discrete mathematics (intro. proofs), Penn State University & University of Utah.
- honors multivariable calculus, University of Utah.
- graduate abstract algebra I & II, University of Utah & Penn State University.
- cryptography, University of Utah.
- topics in commutative algebra, University of Utah.
- introductory algebraic geometry, University of Utah.
- introduction to real analysis, University of Utah.
- undergraduate abstract algebra II, University of Utah.

STUDENTS &
MENTORING

Ph.D. students.

- Andrew Bydlon (Summer 2017, University of Utah, transferred from PSU)
- Javier Carvajal-Rojas (Summer 2018, University of Utah)
- Daniel Smolkin (Summer 2019, University of Utah)
- Marcus Robinson (Summer 2020, University of Utah)
- Seungsu Lee (Summer 2023, University of Utah, expected)
- Peter McDonald, joint with Srikanth Iyengar (Summer 2024, University of Utah, expected)
- Hanlin Cai, joint with Sean Howe (Summer 2024, University of Utah, expected)
- Sandra Rodríguez-Villalobos (Summer 2025, University of Utah, expected)

Masters students.

- Faith Pearson (Spring 2021, University of Utah)
- Ruyi Ma (Fall 2022, University of Utah)

Postdocs.

- Linquan Ma (2015-2018)
- Thomas Polstra (2017-2020)
- Alicia Lamarche, co-mentored with Aaron Bertram, (2020-2024 expected)
- Eamon Quinlan, co-mentored with Anurag Singh, (2021-2024 expected)
- Quentin Posva, co-mentored with Christopher Hacon, (2022-2025 expected)

SELECTED TALKS	• University of Washington algebra seminar	February 2004
	• University of Michigan algebraic geometry seminar	November 2005
	• University of Washington algebra seminar	January 2006
	• Bellingham algebraic geometry seminar (BAGS)	February 2006
	• Recent Trends in Higher Dimensional Geometry, conference in Banff Canada (BIRS)	April 2006
	• Rice algebraic geometry seminar	March 2006
	• University of Michigan algebraic geometry seminar	November 2006
	• Davidson College AMS meeting, special session in commutative algebra	March 2007
	• F -singularities and D -modules conference in Ann Arbor	August 2007
	• University of Illinois at Chicago algebraic geometry seminar	February 2008
	• Purdue University working algebraic geometry seminar	February 2008
	• University of Georgia algebraic geometry seminar	April 2008
	• Conference in honor of Mel Hochster's 65th birthday	August 2008
	• University of Washington algebra seminar	September 2008
	• Vancouver British Columbia AMS Meeting, special session in algebraic geometry	October 2008
	• University of Illinois at Urbana-Champaign algebraic geometry seminar	October 2008
	• University of Utah commutative algebra seminar	November 2008
	• Western algebraic geometry seminar (WAGS conference)	November 2008
	• Syracuse University, colloquium	January 2009
	• University of North Carolina, colloquium	February 2009
	• University of Illinois at Urbana Champaign AMS meeting, special session in commutative algebra	March 2009
	• University of Illinois at Urbana-Champaign, colloquium	April 2009
	• Purdue University algebraic geometry seminar	April 2009
	• Commutative Algebra and its Connections to Geometry (honoring Wolmer Vasconcelos), Pan-American Advanced Study Institute, Olinda Brazil	August 2009
	• University of Kansas, algebra seminar	September 2009
	• Higher Dimensional Algebraic Geometry conference, Research Institute for Mathematical Sciences, Kyoto University, Japan	December 2009
	• Joint mathematical meetings in San Francisco, special session on commutative algebra	January 2010
	• Corcordia University, colloquium	January 2010
	• Washington University, colloquium	January 2010
	• Indiana University Bloomington, algebra seminar	January 2010
	• Indiana University Bloomington, colloquium	January 2010
	• University of Missouri, colloquium	January 2010
	• Louisiana State University, colloquium	February 2010
	• Wayne State University, colloquium	February 2010
	• Penn State University, colloquium	February 2010
	• Rice University, colloquium	February 2010
	• Sheffield University, lecture series	March 2010

Talks are continued on the next page.

SELECTED TALKS CONTINUED	<ul style="list-style-type: none"> • Lexington Kentucky AMS Meeting, special session in commu- March 2010 tative algebra • Harvard-MIT algebraic geometry seminar April 2010 • Frobenius splitting conference May 2010 • Algebra seminar, Johannes Gutenberg-Universität Mainz June 2010 • Commutative Algebra in the Southeast, Conference, Atlanta September 2010 Georgia • University of Utah, Colloquium September 2010 • Purdue University working algebraic geometry seminar October 2010 • Purdue University commutative algebra seminar October 2010 • CIRM, Luminy, Commutative algebra and its interactions with November 2010 algebraic geometry • Western algebraic geometry seminar (WAGS conference) November 2010 • Joint mathematical meetings in New Orleans, special session January 2011 on commutative algebra • Penn State University, algebra and number theory seminar February 2011 • Berkeley-Davis-Stanford Algebraic Geometry Colloquium March 2011 • University of Michigan commutative algebra seminar March 2011 • Midwest Commutative Algebra and Geometry Conference May 2011 • University of Washington, algebra and algebraic geometry May 2011 seminar • Workshop on Almost Purity, University of Michigan May 2011 • University of Osnabrück, college seminar - combinatorial struc- June 2011 tures in algebra and topology • Johannes Gutenberg-Universität Mainz - algebra seminar July 2011 • University of Nebraska - algebraic geometry seminar August 2011 • Route 81 Conference on Commutative Algebra and Algebraic September 2011 Geometry - Cornell University • Stony Brook University, algebra, geometry and physics semi- September 2011 nar • University of Michigan commutative algebra seminar October 2011 • University of Utah AMS meeting, special session in commuta- October 2011 tive algebra • Sheffield University, lecture series January 2012 • Universitat de Barcelona / Universitat Politècnica de January 2012 Catalunya (joint seminar), Seminari de Geometria Algebraica • Penn State University, GAP Seminar February 2012 • University of Illinois at Chicago, algebraic geometry seminar March 2012 • Penn State University, algebra and number theory seminar March 2012 • Princeton University, algebraic geometry seminar March 2012 • Johns Hopkins University, algebraic geometry/number theory March 2012 seminar • ACC for minimal log discrepancies and termination of flips May 2012 conference, American Institute of Mathematics
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Talks are continued on the next page.

SELECTED TALKS	• char- p & p -adic geometry conference, Mainz Germany	June 2012
CONTINUED	• University of Utah, algebraic geometry seminar	September 2012
	• Ohio State University, algebraic geometry seminar	September 2012
	• Georgia State University, colloquium	October 2012
	• Georgia State University, commutative algebra seminar	October 2012
	• Johns Hopkins University, algebraic geometry/number theory seminar	November 2012
	• Princeton University, algebraic geometry seminar	November 2012
	• Trends in Arithmetic Geometry, Lorentz Center, Leiden, the Netherlands	January 2013
	• Penn State, algebra and number theory seminar	February 2013
	• University of Washington, algebra and algebraic geometry seminar	March 2013
	• Columbia University, algebraic geometry seminar	March 2013
	• Imperial College of London, 6 lectures, Workshop: Characteristic p methods in algebraic geometry	April 2013
	• Southern California Algebraic Geometry Seminar, a joint meeting of Caltech, UC Los Angeles, UC San Diego, and the University of Southern California	April 2013
	• American Institute of Mathematics, conference on The minimal model program in characteristic p .	May 2013
	• Math Science Research Institute, Conference: The Commutative Algebra of Singularities in Birational Geometry: Multiplier Ideals, Jets, Valuations, and Positive Characteristic Methods	May 2013
	• CIRM Luminy, Commutative algebra and its interactions with algebraic geometry	July 2013
	• Penn State University, algebra and number theory seminar	August 2013
	• University of Georgia, algebraic geometry seminar	September 2013
	• Georgia State University, commutative algebra seminar	September 2013
	• Johns Hopkins University, algebraic geometry/number theory seminar	October 2013
	• Birational Geometry and Singularities in Positive Characteristic, a conference at the University of Tokyo	November 2013
	• Mini-workshop on Cremona group – University of Utah	November 2013
	• University of Illinois at Chicago algebraic geometry seminar	November 2013
	• Joint mathematical meetings in Baltimore, special session on algebraic geometry	January 2014
	• University of California at Irvine, colloquium	January 2014
	• University of California at Davis, colloquium	January 2014
	• University of Utah, colloquium	February 2014
	• University of California at Utah, algebraic geometry seminar	February 2014

Talks are continued on the next page.

SELECTED TALKS
CONTINUED

- Birational Geometry and Foliations workshop – Hausdorff Research Institute for Mathematics **February 2014**
- Queens University, algebraic geometry seminar **March 2014**
- University of South Carolina, colloquium **March 2014**
- Texas Algebraic Geometry Symposium (TAGS) **March 2014**
- George Mason University, colloquium **April 2014**
- George Mason University, combinatorics and algebra seminar **April 2014**
- Penn State University, algebra and number theory seminar **April 2014**
- Introduction to Cartier modules (3 lectures), Special Month on “Birational Geometry and Singularities in Zero and Positive Characteristic” held at the University of Michigan. **June 2014**
- Research presentation, Special Month on “Birational Geometry and Singularities in Zero and Positive Characteristic” held at the University of Michigan. **June 2014**
- University of Utah, algebraic geometry seminar **September 2014**
- Route 81 conference – Cornell University **September 2014**
- Western algebraic geometry seminar (WAGS conference) – University of Idaho **October 2014**
- Georgia algebraic geometry symposium (GAGS conference) – University of Georgia **October 2014**
- Georgia Tech, algebra seminar **October 2014**
- University of Michigan, algebraic geometry seminar **January 2015**
- Georgetown University AMS Meeting, Special Session on Closure Operations in Commutative Algebra **March 2015**
- Conference on Frobenius Operators and Cartier Algebras – Georgia State University **March 2015**
- AMS summer institute in Algebraic Geometry – University of Utah **July 2015**
- Mini-course at the Multiplier ideals, Test ideals and Bernstein-Sato polynomials, conference – Universitat Politècnica de Catalunya, Barcelona **September 2015**
- Joint mathematical meetings in Seattle, special session on commutative algebra, **January 2016**
- University of Illinois at Chicago, algebraic geometry seminar **April 2016**
- Differential forms in algebraic geometry (conference) – University of Freiburg, Germany **September 2016**
- KUMUNU – regional commutative algebra conference **October 2016**
- Nihon University Singularities Seminar **November 2016**
- University of Tokyo Algebraic Geometry Seminar **November 2016**
- SLAM (Southwest Local Algebra Meeting) – University of New Mexico **March 2017**
- AGNES (Algebraic Geometry Northeastern Series) – Stony Brook University **April 2017**

Talks are continued on the next page.

SELECTED TALKS	• London Geometry and Topology Seminar	May 2017
CONTINUED	• Higher Dimensional Algebraic Geometry 2017, Taipei, Taiwan	June 2017
	• The Prospects for Commutative Algebra, Osaka, Japan	July 2017
	• University of North Texas AMS Meeting, Special Session on Commutative Algebra, Denton, Texas	September 2017
	• EPFL Lausanne, Algebraic Geometry Seminar	September 2017
	• Algebraic Geometry: Birational Classification, Derived Categories, and Moduli Spaces, Oberwolfach, Germany	September 2017
	• University of Arizona, Algebraic Geometry Seminar	November 2017
	• Mexican National Congress of Algebraic Geometry, Plenary Lecture	February 2018
	• Math Science Research Institute, Hot Topics Workshop: The Homological Conjectures, MSRI, Berkeley	March 2018
	• Lecture Series, Tianyuan Advanced Seminar on Moduli Spaces in Algebraic Geometry	April 2018
	• University of Washington, Algebraic Geometry Seminar	May 2018
	• University of Illinois at Chicago, Commutative Algebra Seminar	October 2018
	• Purdue University, Commutative Algebra Seminar	October 2018
	• University of Arkansas AMS Meeting, Special Session on Advances in Birational Geometry, Fayetteville Arkansas	November 2018
	• University of Michigan, Commutative Algebra Seminar	November 2018
	• University of Michigan, Algebraic Geometry Seminar	November 2018
	• Lecture Series, Introductory Workshop: Derived Algebraic Geometry and Birational Geometry and Moduli Spaces, Math Science Research Institute (MSRI), Berkeley	January 2019
	• University of Hawaii AMS Meeting, Special Session on Commutative Algebra and its Environs, Honolulu Hawaii.	March 2019
	• Workshop on Algebraic Geometry, Fudan University, Shanghai, China.	July 2019
	• University of Michigan, Algebraic Geometry Seminar	October 2019
	• Johns Hopkins University, Algebraic Geometry Seminar	October 2019
	• Joint mathematical meetings in Denver, special session on commutative algebra	January 2020
	• Virtual joint mathematical meetings, special session on commutative algebra in positive characteristic	January 2021
	• Geometry Seminar, Roma Tres (Virtual)	April 2021
	• ZAG (Zoom Algebraic Geometry) Seminar (Virtual)	April 2021
	• Tata Institute for Fundamental Research, Colloquium (Virtual)	August 2021

Talks are continued on the next page.

SELECTED TALKS	• University of Washington, Algebra and Algebraic Geometry Seminar	October 2021
CONTINUED	• University of Illinois at Chicago, Algebraic Geometry Seminar	October 2021
	• Michigan State University, Algebraic Geometry Seminar	November 2021
	• Georgia Algebraic Geometry Symposium, Emory University	April 2022
	• Algebraic geometry and singularities workshop and conference, University of Washington	June 2022
	• CIMAT, Guanajuato Mexico, colloquium and two seminars	August 2022
	• MMP and Moduli Conference, Simons Center	October 2022
	• University of South Carolina, Algebraic Geometry Seminar	January 2023