

CHRISTINE BERKESCH

Curriculum Vitae

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Employment

- 2013 – University of Minnesota, Assistant Professor
- 2011 – 2013 Duke University, Assistant Research Professor
- 2012 Fall MSRI (Mathematical Sciences Research Institute), Postdoctoral Fellow
Program: Commutative Algebra
- 2011 Spring Institut Mittag-Leffler, Postdoctoral Fellow
Program: Algebraic Geometry with a view towards applications
- 2010 – 2011 Stockholm University, NSF International Postdoctoral Fellow (Host: Mikael Passare)

Education

- 2010 Ph.D. Purdue University, Mathematics (Advisor: Uli Walther)
Thesis title: Euler–Koszul homology in algebra and geometry
- 2004 B.A. Butler University, Mathematics (with Honors Thesis)

Awards and grants

- 2017 – 2020 NSF DMS 1661962 Grant: Homological commutative algebra and group actions in geometry
- 2017 – 2018 NSF DMS 1744247 Grant: CA+: An Upper Midwest Commutative Algebra Conference
- 2017 – 2018 NSF DMS 1700748 Grant: Conference: Local cohomology in commutative algebra and algebraic geometry
- 2015 – 2017 NSF DMS 1549892 Grant: Upper Midwest Commutative Algebra Colloquium
- 2013 – 2017 NSF DMS 1440537 Grant: Homological commutative algebra, polyhedral structure, and algebraic geometry
- 2013 AWM–NSF Travel Grant
- Spring 2013 Teaching evaluations in top 5% among undergraduate small course instructors at Duke
- 2012 Banff International Research Station, Research in Teams Grant
- 2012 AMS Mathematical Research Communities Collaboration Grant
- 2011 – 2013 AMS–Simons Travel Grant
- 2010 – 2011 NSF OISE 0964985 International Research Fellowship Program Grant
One of five partially supported by the Office of Multidisciplinary Activities
- 2009 – 2010 Bilsland Dissertation Fellowship
- 2007 Purdue University Graduate School Summer Research Grant
- 2004 – 2006 Clare Boothe Luce Foundation Fellowship
- 2004 Corrine Welling Scholarship
- 2004 Butler University Outstanding Graduating Mathematics Major Award
- 2000 – 2004 Lilly Endowment Community Scholarship
- 2003 Joint Mathematics Meetings Undergraduate Poster Session Award (as one of top 12)
- 2002 Robert D. Whitesell Award for Academic Excellence in Mathematics, Butler University

Research interests

Combinatorial aspects of algebra and geometry

Papers

Peer-reviewed articles

- 2016 1. (with Jens Forsgård, Laura Felicia Matusevich) On the parametric behavior of A -hypergeometric series, *Trans. Amer. Math. Soc.* (to appear), 20 pages. arXiv:math.AG/1603.08954
2. (with Jens Forsgård, Laura Felicia Matusevich) Hypergeometric functions for projective toric curves, *Adv. Math.* **300** (2016), 835–867. arXiv:math.AG/1412.3957
- 2015 3. (with Laura Felicia Matusevich, Uli Walther) Singularities and holonomicity of binomial D -modules, *J. Algebra* **439** (2015), 360–372. arXiv:math.AG/1308.5898
4. (with Stephen Griffeth, Ezra Miller) Systems of parameters and holonomicity of A -hypergeometric systems, *Pacific J. Math.* **276-2** (2015), 281–286. arXiv:math.AG/1302.0048
- 2014 5. (with Stephen Griffeth, Steven V Sam) Jack polynomials as fractional quantum Hall states and the Betti numbers of the $(k + 1)$ -equals ideal, *Comm. Math. Phys.* **330** (2014), no. 1, pp. 415–434. arXiv:math.MP/1303.4126
6. (with Jens Forsgård, Mikael Passare) Euler–Mellin integrals and A -hypergeometric functions, *Michigan Math. J.* **63** (2014), no. 1, 101–123. arXiv:math.CV/1103.6273
- 2013 7. (with Daniel Erman, Manoj Kummini, Steven V Sam) Tensor complexes: Multilinear free resolutions constructed from higher tensors, *J. European Mathematical Society* **15** (2013), no. 6, 2257–2295. arXiv:math.AC/1101.4604
8. (with Daniel Erman, Manoj Kummini) Three flavors of extremal Betti tables, *Commutative Algebra*, 99–121, Springer, New York, 2013. arXiv:math.AC/1207.5707
- 2012 9. (with Daniel Erman, Manoj Kummini, Steven V Sam) Poset structures in Boij–Söderberg theory, *International Mathematics Research Notices* (2012), vol. 2012, 5132–5160. arXiv:math.AC/1010.2663
10. (with Daniel Erman, Manoj Kummini, Steven V Sam) Shapes of free resolutions over a local ring, *Mathematische Annalen* **354** (2012), no. 3, 939–954. arXiv:math.AC/1105.2244
11. (with Jesse Burke, Daniel Erman, Courtney Gibbons) The cone of Betti diagrams over a hypersurface ring of low embedding dimension, *J. Pure Applied Algebra* **216** (2012), no. 10, 2256–2268. arXiv:math.AC/1109.5198
- 2011 12. The rank of a hypergeometric system, *Compositio Mathematica* **147** (2011), no. 1, 284–318. arXiv:math.AG/0807.0453
- 2010 13. (with Anton Leykin) Algorithms for Bernstein–Sato polynomials and multiplier ideals, *ISSAC 2010: Proceedings of the 2010 International Symposium on Symbolic and Algebraic Computation*, 99–106, ACM, New York, 2010. arXiv:math.AG/1002.1475
- 2009 14. (with Laura Felicia Matusevich) A -graded methods for monomial ideals, *J. Algebra* **322** (2009), 2886–2904. arXiv:math.AC/0807.4306

Preprints

15. (with Laura Felicia Matusevich, Uli Walther) Torus equivariant D -modules and hypergeometric systems, 33 pages. arXiv:math.AG/1308.5901
16. (with Laura Felicia Matusevich, Uli Walther) On normalized Horn systems, 15 pages.
17. (with Daniel Erman, Gregory G. Smith) Virtual resolutions for a product of projective spaces, 22 pages. arXiv:math.AG/1703.07631

Expository work

- Free complexes on smooth toric varieties, *Mathematisches Forschungsinstitut Oberwolfach Report*, **57** (2016).

- (with Frank-Olaf Schreyer) Syzygies, finite length modules, and random curves, *Commutative Algebra and Noncommutative Algebraic Geometry*, Mathematical Sciences Research Institute Publications (2015), Vol. 1, 25–52. arXiv:math.AC/1403.0581
- Boij–Söderberg theory and tensor complexes, *Mathematisches Forschungsinstitut Oberwolfach Report* **10** (2013), no. 2, pp. 1504–1506.

Lecture series, lectures, and presentations

Lecture series

- 2013–2014 University of Minnesota: Euler–Koszul homology and hypergeometric systems [9 hours]
 2010 Oct. KTH, Stockholm: Euler–Koszul homology and hypergeometric systems [4 hours]

Invited (international audience)

- 2018 Mar. Chemnitz, Germany: Singularities, Toric Geometry and Differential Equations
 2017 Oct. Edmonton, Canada: Canadian Western Algebraic Geometry Symposium
 July Berkeley, CA: M2 Conference/Workshop
 May Martha’s Vineyard, MA: A View Towards Algebraic Geometry
 Jan. Montréal, Canada: Combinatorial Algebra meets Algebraic Combinatorics
 2016 Dec. Oberwolfach, Germany (MFO): Asymptotic Phenomena in Local Algebra
 Oct. Fields Institute, Toronto, ON: Workshop on Convexity in Algebraic Geometry
 July Herstmonceux Castle, East Sussex, UK: Algebraic Combinatorics and Group Actions
 Apr. Banff, Canada (BIRS): Free Resolutions, Representations, and Asymptotic Algebra
 2014 Sept. Levico Terme, Italy: Meeting On Combinatorial Commutative Algebra (MOCCA)
 June Institut Mittag-Leffler, Djursholm, Sweden: Algebraic Geometry days in honor of Dan Laksov
 2013 Dec. Hanoi, Vietnam: International Conference on Commutative Algebra and Its Interactions
 July Utrecht University: Conference on Special Functions and Special Numbers for Frits Beukers
 May Berlin, Germany: Syzygies in Berlin
 May Oberwolfach, Germany (MFO): Constructive Homological Algebra
 Mar. Kleinwalsertal, Austria: Perspectives & Emerging topics in Algebra & Kombinatorics (PEAKs)
 2012 Dec. Berkeley, CA (MSRI): Combinatorial Commutative Algebra and Applications
 2011 Dec. Toronto, ON (CMS): Scientific Session on Algebraic Geometry and Commutative Algebra
 Apr. University of Leiden: Intercity Number Theory Seminar
 Feb. Institut Mittag-Leffler, Djursholm, Sweden: Algebraic Geometry Program Seminar
 2010 Oct. Freie Universität, Berlin: Algebra Seminar
 Sept. KTH and Stockholm University: Algebra and Geometry Seminar
 Sept. University of Barcelona: Algebra Seminar
 Sept. Stockholm University: Pluricomplex Seminar
 June Berkeley, CA (AMS–SMM): Special Session, Commutative Algebra, Representation Theory
 Jan. Sevilla, Spain: International School of Combinatorics for Pilar Pisón-Casares
 2007 Sept. Kleinwalsertal, Austria: Summer School on Hypergeometric Functions

Invited (domestic audience; not including seminars)

- 2017 Nov. Chicago, IL (UIC): Undergraduate Mathematics Symposium
 Jan. Butler University: Departmental Colloquium
 2016 June West Lafayette, IN: EDGE Reunion Weekend Plenary Speaker
 Apr. Minneapolis, MN: Upper Midwest Commutative Algebra Colloquium Expository Lecture
 Mar. Purdue University: Mathematics Recruitment Weekend Speaker
 2015 Oct. Chicago, IL (AMS): Special Session, Commutative Algebra
 Aug. West Lafayette, IN: Midwest Commutative Algebra Meeting
 Jan. San Antonio, TX (JMM): Special Session, Syzygies

- 2014 Oct. Chicago, IL (AlGeCom): Algebra, Geometry, and Combinatorics Day 11
 Oct. Moscow, ID (WAGS): Western Algebraic Geometry Symposium
 Sept. Eau Claire, WI (AMS): Special Session, Directions in Commutative Algebra
- 2013 Oct. Philadelphia, PA (AMS): Special Session, Combinatorial Commutative Algebra
 Aug. Fort Collins, CO (SIAM): Minisymposium on D -modules in Applied Algebraic Geometry
 Aug. Fort Collins, CO (SIAM): Minisymposium on Algebro-geometric approaches to tensor spaces
 Mar. Purdue University: Mathematics Recruitment Weekend Speaker
 Jan. University of Illinois, Urbana-Champaign: Departmental Colloquium
 Jan. North Carolina State University: Special Departmental Seminar
 Jan. University of Notre Dame: Departmental Colloquium
- 2012 Dec. University of Minnesota: Special Departmental Seminar
 Apr. Wake Forest University: Departmental Colloquium
 Mar. Lawrence, KA (AMS): Special Session, Topics in Commutative Algebra
- 2011 Oct. Salt Lake City (AMS): Special Session, Computational & Algorithmic Algebraic Geometry
 Oct. Raleigh, NC (SIAM): Minisymposium on Combinatorial Structures in Algebraic Statistics
 Sept. Winston-Salem, NC (AMS): Special Session, Combinatorial Algebraic Geometry
 Sept. ICERM, Providence, RI (AWM): Special Session, Algebraic Geometry, Commutative Algebra
 June MSRI: Summer Graduate Workshop in Commutative Algebra
 Jan. New Orleans, LA (JMM): Special Session, Combinatorial Algebraic Geometry
- 2010 Mar. Butler University: Departmental Colloquium
 Feb. Sam Houston State University: Departmental Colloquium
 Jan. San Francisco, CA: Joint Mathematics Meeting, Special Session, Commutative Algebra
- 2009 Apr. Raleigh, NC (AMS): Special Session, Recent Advances in Symbolic Algebra and Analysis
- 2008 Apr. Bloomington, IN (AMS): Special Session, D -modules

Seminars (domestic)

- 2017 Mar. University of Michigan: Commutative Algebra Seminar
- 2016 Oct. University of Minnesota: Introduction to Research Seminar
- 2014 Dec. University of Minnesota: Introduction to Research Seminar
 Feb. University of Minnesota: Combinatorics Seminar
 Jan. Texas A&M University: Geometry Seminar
- 2013 Nov. University of Wisconsin: Algebraic Geometry Seminar
 Oct. University of Minnesota: Introduction to Research Seminar
 Feb. Duke University: Algebraic Geometry Seminar
- 2012 Nov. San Francisco State University: Algebra, Geometry, and Combinatorics Seminar
 Nov. Texas A&M University: Geometry Seminar
 Sept. UC Berkeley: Commutative Algebra and Algebraic Geometry Seminar
 Apr. North Carolina State University: Algebra and Combinatorics Seminar
 Apr. University of North Carolina: Geometric Representation Theory Seminar
 Feb. University of Michigan: Commutative Algebra Seminar
 Jan. Texas A&M University: Algebra and Combinatorics Seminar
- 2011 Nov. North Carolina State University: Symbolic Computation Seminar
 Jan. Stanford University: Algebraic Geometry Seminar
- 2010 Mar. Purdue University: Bridge to Research Seminar
 Feb. University of Nebraska, Lincoln: Commutative Algebra Seminar
 Feb. University of Nebraska, Lincoln: Mathematical Landscapes Seminar
- 2009 Nov. University of Illinois, Urbana-Champaign: Algebra-Geometry-Combinatorics Seminar
 Oct. University of Michigan: Commutative Algebra Seminar

- Sum. Purdue University: Multiplier Ideals Seminar
- Apr. MSRI: Algebraic Geometry Program Graduate Student Seminar
- Feb. Purdue University: Student Commutative Algebra Seminar
- Feb. University of Notre Dame: Algebraic Geometry and Commutative Algebra Seminar
- 2008 Oct. Texas A&M University: Geometry Seminar
- Oct. Purdue University: Boij–Söderberg Conjectures Seminar
- Oct. Purdue University: Working Algebraic Geometry Seminar
- Sum. Purdue University: Characteristic Classes Topology Seminar

Poster Presentations

- 2011 June Stockholm: Effective Methods in Algebraic Geometry (MEGA), Invited Poster Session
- 2010 Sept. Barcelona: First Swedish–Catalan Conference in Mathematics
 - Apr. Amherst, MA: Algebraic Geometry Northeastern Series (AGNES)
- 2004 Jan. Phoenix, AZ: Joint Mathematics Meetings, Undergraduate Poster Session
- 2003 Jan. Baltimore, MD: Joint Mathematics Meetings, Undergraduate Poster Session

Teaching activities

Courses taught at Minnesota

- 2018 Spring Computational Algebraic Geometry (Math 5385)
- 2018 Spring Commutative and Homological Algebra II (Math 8212)
- 2017 Fall Commutative and Homological Algebra I (Math 8211)
- 2017 Spring General Algebra II (Math 8202)
- 2016 Fall General Algebra I (Math 8201)
- 2016 Fall Introduction to Modern Algebra (Math 4281)
- 2016 Spring Calculus I (Math 1271)
- 2015 Spring Commutative and Homological Algebra II (Math 8212)
- 2014 Fall Commutative and Homological Algebra I (Math 8211)
- 2014 Spring Introduction to Modern Algebra (Math 4281)
- 2013 Fall Introduction to Modern Algebra (Math 4281)

Courses taught at Duke

- 2013 Spring Introduction to Algebraic Structures II (Math 502)
- 2012 Spring Abstract algebra (Math 121)
- 2012 Spring Honors multivariable calculus (Math 105)
- 2011 Fall Graduate course on hypergeometric systems (Math 378, 5 weeks)
- 2011 Fall Multivariable calculus (Math 103)

Courses taught at Purdue

- 2008 Fall Second semester business calculus (Math 224), with exam-writing responsibilities
- 2007 Fall First semester business calculus (Math 223), with exam-writing responsibilities
- 2007 Spring Algebra/trigonometry (Math 154)
- 2006 Fall Single-variable engineering calculus (Math 161E), recitation for at-risk students

Other teaching activities

- 2011 June MSRI Workshop Postdoc TA: Summer Graduate Workshop in Commutative Algebra
- 2009 Spring Grader for the undergraduate abstract algebra course, Purdue University
- 2003–2004 Butler University Mathematics Tutoring Lab Student Coordinator
- 2002–2004 Butler University Mathematics Tutoring Lab Tutor

Mentoring activities

Graduate student advisor at Minnesota
2016– Mike Loper

Graduate student Math Alliance mentor at Minnesota
2017– Drisana Mosaphir, Cecily Santiago

Graduate student initial advisor at Minnesota
2017– Emily Tibor
2014–2017 Cora Brown, Sunita Chepuri, Michelle Pinharry

Undergraduate students advised at Minnesota

2017 Spring Waylan Hedine, Senior project
2014 Fall Zach Adams, Senior project
Milton Stephens IV, Senior project
2014 Spring Samuel Jirele, Senior project
Milton Stephens IV, Senior project
Xuan Wang, Senior project

Undergraduate student advised at Duke

2011–2012 Danny Thielman (Mathematics major), Senior thesis: *Chemical Reaction Networks*
(following summer PRUV project under the guidance of Anne Shiu)

Mentoring program organization and participation

2017– Math Alliance mentor
2017 Oct. Field of Dreams Conference Panelist: How to Prepare for your First Academic Position
2016 June EDGE Reunion Weekend Plenary Speaker
2016 Mar. Purdue University Mathematics Recruitment Weekend Speaker
2014– Association for Women in Mathematics Mentor Network mentor
2014 Aug. Interview for Girls' Angle Bulletin, a mathematical magazine for girls in grades 5-12
2014– Leader of the Minnesota cluster of the EDGE Mentoring Network
2013– University of Minnesota Women in Mathematics (WiM) Program
2013 Mar. Purdue University Mathematics Recruitment Weekend Speaker
2012–2013 Co-founder and organizer of MATH MENTORING
A mentoring program for women in mathematics at Duke University
(with Carla Cederbaum, Ben Cooke, Sarah Schott)
2012 Mar. Organized North Carolina EDGE Mentoring Network Day at Duke University
2004– Member of the EDGE Mentoring Network
2004–2008 Purdue University Graduate Women in Science Program

Professional service**Organizing activities for conferences and meetings**

2017 Aug. Minneapolis, MN: Local cohomology in commutative algebra and algebraic geometry
(with Uli Walther, Wenliang Zhang)
2015– Universities of Minnesota and Wisconsin: CA+, an annual weekend meeting in algebra
(with Daniel Erman and Steven Sam, formerly the Upper Midwest Commutative
Algebra Colloquium)
2014 Sept. Eau Claire, WI (AMS): Special Session, New trends in toric geometry (with Daniel
Erman, Hal Schenck)
2012 Feb. Durham, NC: Triangle Lectures in Combinatorics (with Ezra Miller, Sonja Mapes)

- 2011 Oct. Salt Lake City, UT (AMS): Special Session, Hypergeometric functions and differential equations (with Laura Felicia Matusevich)
- 2011 Jan. New Orleans, LA (JMM): Special Session, Commutative Algebra (MRC) (with Bhargav Bhatt, Jason McCullough, Javid Validashti)

Journals edited

J. of Software for Algebra and Geometry

Journals refereed

Advances in Mathematics	Communications in Algebra
Compositio Mathematica	International Mathematics Research Notices
J. of Combinatorial Theory, Series A	J. of Commutative Algebra
J. of Mathematical Analysis and Applications	J. of Pure and Applied Algebra
J. of Software for Algebra and Geometry	J. of Symbolic Computation
J. of the European Mathematical Society	London Mathematical Society Lecture Notes
Proceedings of the AMS	Revista Matemática Iberoamericana
Rocky Mountain J. of Mathematics	Mathematische Zeitschrift

Professional memberships

AMS (since 2004) AWM (since 2006) MAA (since 2010)

SI(AG)²: SIAM Activity Group in Algebraic Geometry (since 2010)

Seminars organized

2013– Commutative Algebra Seminar (Minnesota)

2012 Fall Commutative Algebra Program Postdoc Seminar (MSRI)

2010 Fall Pluricomplex Seminar (Stockholm University)

2009 Sum. Multiplier Ideals Seminar (Purdue)

2008 Fall Boij–Söderberg Theory Seminar (Purdue)

Committees at Minnesota

2017–2018 School of Mathematics Dunham Jackson Postdoc Search Committee

2014–2018 School of Mathematics Graduate Studies Committee

2015–2017 School of Mathematics Computer Committee

2014–2015 School of Mathematics Newsletter Committee

2013–2014 School of Mathematics Undergraduate Programs Committee

Committees at Purdue

2007–2009 College of Science Grade Appeals Committee

2006–2007 Graduate Student Representative to the Department of Mathematics

2004–2006 Graduate Women in Science Program Leadership Team

Committees at Butler

2003–2004 College of Liberal Arts and Sciences Dean’s Student Advisory Committee

Invited participation at conferences and research experiences

2012 Aug. Banff, Canada (BIRS): Syzygies in Algebraic Geometry, with an exploration of a connection with String Theory

2010 June Snowbird, UT: AMS Mathematical Research Communities: Commutative Algebra,

2009 Oct. Palo Alto, CA (AIM): Macaulay2 Conference, Implementing algebraic geometry algorithms (invited participant and developer)

2008 June Snowbird, UT: AMS Mathematical Research Communities: Computational Algebra and Convexity,

2004 June Atlanta, GA (Spelman): The EDGE Program for women and minorities entering graduate school in mathematics

2003 Sum. Indianapolis, IN: Butler Summer Institute Research Program (Mentor: Prem Sharma)

2002 Sum. Mount Pleasant, MI: NSF REU, Central Michigan University (Mentor: Ken W. Smith)

References

Available upon request.