

Sonja Mapes

CURRICULUM VITAE

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Education:

Columbia University:

Ph.D. in Mathematics, May 2009
M.Phil. in Mathematics, February 2006
M.A. in Mathematics, May 2004

Advisor: David Bayer

Thesis title: *Finite atomic lattices and their relationship to resolutions of monomial ideals*

University of Notre Dame:

B.S. in Mathematics, *magna cum laude*, May 2002

Academic positions:

University of Notre Dame:

Associate Professor of the Practice, Director of Undergraduate Studies, November 2016 - present
Assistant Professor of the Practice, Director of Undergraduate Studies, June 2014-November 2016
Research Assistant Professor, July 2012 - June 2014
Visiting Scholar, January 2012-June 2012

Duke University:

Assistant Research Professor, August 2009 – December 2011

Professional memberships:

American Mathematical Society

Personal:

Legal/Married name: Sonja Mapes Szekelyhidi
Born June 1980
U.S. citizen

Honors:

Course Evaluations in top 5% of all undergraduate instructors at Duke, Fall 2011
Columbia University Presidential Teaching Award, 2009
AWM Alice T. Schafer Prize - Honorable Mention 2002
George Kolettis Award (Notre Dame Mathematics Department) 2002

Research interests:

My main research interest is combinatorial commutative algebra with a focus on free resolutions of monomial ideals, and toric ideals. More generally, I am interested in computational aspects of commutative algebra and algebraic geometry, and have been active in using and developing Macaulay2. I am also interested in connections to algebraic geometry and tropical geometry.

Publications:

“Constructing monomial ideals with a given minimal resolution”, with Lindsay C. Piechnik,

arXiv:1509.06298, to appear in Rocky Mountain Journal of Mathematics.

“The Betti poset in monomial resolutions”, with Timothy B. Clark, arXiv:1407.5702, submitted.

“Partially ordered sets in Macaulay2”, with David Cook II, and Gwyneth Whieldon, *Journal for Software for Algebra and Geometry* 7-1 (2015), 9–15. DOI 10.2140/jsag.2015.7.9-15.

“Rigid monomial ideals”, with Timothy B. Clark, *J. Comm. Alg.* **6 (1)** (2014), 33-51.

“Finite atomic lattices and resolutions of monomial ideals”, *J. Algebra* **379** (2013), 259-276

“Finite atomic lattices and their relationship to resolutions of monomial ideals”, Ph.D. Thesis, Columbia University, May 2009.

“Constructing almost excellent unique factorization domains” (with John Bryk, Charles Samuels, Grace Wang), *Communications in Algebra* **2005** 33 (5) 1321–1336.

Grants recieved:

“Midwest Women in Math Symposium (Midwest WIMS)”, NSF DMS-1419428, award date January 1, 2014 (co-PI)

Invited lectures:

“The Betti Poset in monomial resolutions”, Special Section on Commutative Algebra, AMS Sectional Meeting, University of Utah, April 2016.

“Studying resolutions of monomial ideals via the study of finite atomic lattices”, Loyola University Maryland, September 2015

“Rigid monomial ideals and poset resolutions”, Columbia University Discrete Math seminar, March 2014

“Poset resolutions and monomial ideals”, Midwest Women in Mathematics Symposium, University of Illinois at Chicago, April 2013

“Minimal free resolutions of rigid monomial ideals”, Special Session on Combinatorial Commutative Algebra, AMS Sectional Meeting, University of Kansas, March 2012

“Poset resolutions and rigid monomial ideals”, Special Session on Combinatorics: Algebraic and Geometric, AMS Sectional Meeting, University of South Florida, March 2012

“Minimal free resolutions of rigid monomial ideals”, Algebra/Combinatorics seminar, North Carolina State University, November 2011

“Rigid monomial ideals.” Department Colloquium, University of Notre Dame, February 2011

“LCM-lattices and free resolutions of monomial ideals.” Department Colloquium, Oklahoma State University, October 2010.

“LCM lattices and resolutions of monomial ideals.” Special Session on Commutative Algebra and Representation Theory, AMS-SMM International Meeting, Berkeley, CA, Summer 2010.

“Resolutions of monomial ideals and lcm lattices.” Special Session on Combinatorial Algebra, AMS Sectional Meeting, University of Kentucky, Spring 2010.

“Finite atomic lattices and their relationship to cellular resolutions.” Special Session on Graded Resolutions, AMS Sectional Meeting, Florida Atlantic University, October 2009.

“Cellular resolutions of monomial ideals and LCM lattices.” Special Session Commutative Algebra and Applications to Algebraic Geometry, AMS Sectional Meeting, Pennsylvania State University, October 2009.

“Cellular resolutions of monomial ideals and LCM lattices.” Algebra and Combinatorics Seminar, North Carolina State University, September 2009.

“Finite atomic lattices and resolutions of associated monomial ideals.” Special Section on Computational Algebra and Convexity, AMS Joint Meetings, Washington DC, January 2009

“LCM lattices and resolutions of monomial ideals.” Valley Geometry Seminar, University of Massachusetts, November 2008

“Cellular resolutions of monomial ideals.” Gallaudet University, November 2008

“Finite atomic lattices and resolutions of associated monomial ideals.” Route 81 Conference, Queens University, October 2008

“LCM lattices and Cellular Resolutions of Monomial Ideals.” Special session on Hilbert Functions and Resolutions. AMS Regional Meeting, Vancouver, October 2008

Expository Talks:

“Monomial ideals: What an algebraist can learn using combinatorics.” Grad/Fac Seminar, Duke University, November 2009.

”Multigradings and Cox Rings.” Algebraic Geometry working seminar on Toric Varieties, Duke University, September 2009.

“Introduction to Tropical Geometry.” Undergraduate Math Society, Columbia University, October 2008

“Versal deformation of an isolated singularity.” Graduate algebraic geometry seminar, Columbia University, October 2006

“Flat descent of quasi-coherent sheaves.” Graduate algebraic geometry seminar, Columbia University, February 2006

“The tropical Grassmanian.” Tropical Geometry seminar, Rutgers University, October 2005

Conferences and Workshops attended (selected, excluding conferences organized):

AMS Summer Institute in Algebraic Geometry, University of Utah, July 2015 (first week)

International Congress of Mathematics, Seoul, Korea, August 2014

Midwest Women in Mathematics Symposium, UIC, April 2013

Combinatorial Commutative Algebra and Applications, MSRI, December 2012

Macaulay2 workshop, Wake Forest, August 2012

Macaulay2 workshop, MSRI, January 2010

Triangle Lectures in Combinatorics, NC State, Spring 2010, Fall 2010, Fall 2011, Spring 2012

Connections for Women in Algebraic Geometry/Classical Algebraic Geometry Today, MSRI, January 2009

Macaulay2 workshop. Snowbird, Utah, June 2008

AMS - Mathematical Research Communities: Computational Algebra and Convexity. Snowbird, Utah, June 2008

Macaulay2 Conference. Cornell University, March 2008

Women and Mathematics: Algebraic geometry and group actions. IAS, May 2007

Advances in Algebra and Geometry. MSRI, April 2007

Workshop on Computational and Combinatorial Commutative Algebra. Fields Institute, July 2006

Summer school: Monomial Resolutions and Hilbert Functions. Cornell University, May 2006

Arizona Winter School. University of Arizona, March 2006

Route 81. Cornell University, Syracuse University, Queen's University Fall 2005, 2006, 2007, 2008
MAGIC. University of Notre Dame, October 2005
Summer school in Commutative Algebra: Local Cohomology and its interactions with algebra,
geometry, and analysis. Snowbird, Utah, June 2005

Conferences/Workshops/Seminars organized:

Special Session on Combinatorial and Computational Algebra, AMS Sectional at Loyola University,
October 2015 (co-organizer)
Math For Everyone Public Lecture Series, Notre Dame, Fall 2014 - present
Macaulay2 school and research meeting, UIUC summer 2014 (co-organizer)
Midwest Women in Mathematics, University of Notre Dame, spring 2014 (co-organizer)
Macaulay2 workshop, MSRI, January 2014 (co-organizer)
SUMR reunion conference, University of Notre Dame, spring 2013 (co-organizer)
Algebraic Geometry Seminar, Duke University, Spring 2011 (co-organizer)
Triangle Lectures in Combinatorics, Duke University, Fall 2010 (co-organizer), Spring 2012 (co-organizer)

Other scholarly contributions:

Developer of the "Posets" package for Macaulay 2

Teaching experience:

Notre Dame:

Fall 2016: Mathematics USEM (topic: group theory); Honors Algebra 1
Spring 2016: Linear Algebra; Groups reading group (undergrad)
Fall 2015: Calculus 3; Graduate Algebraic geometry
Spring 2015: Calculus 3
Fall 2014: Graduate Algebraic Geometry; Calculus 3
Spring 2014 : Linear algebra; Toric varieties reading group (undergrad)
Before 2014: Calculus 3; Honors Algebra 4; Honors Algebra 3;
Algebraic Geometry reading group (undergrad)

Duke:

Fall 2011	Linear Algebra and Applications
Spring 2011	Algebraic Structures II; Linear Algebra and Applications
Fall 2010	Introduction to abstract algebra
Spring 2010	Linear Algebra and Applications
Fall 2009	Intermediate Calculus (Multivariable Calculus)

Columbia:

Summer 2004,2005,2008,2009	Instructor, College Algebra and Analytic Geometry
Summer 2005,2007	Instructor, Calculus I
2003-2009	Teaching Assistant, various courses

Undergraduate Mentoring experience:

Kevin Latimer, University of Notre Dame - Matroid Package for Macaulay2, Summer 2016-present
Caroline Jensen and Jack Burkhart, University of Notre Dame SUMR program - Graphs Package
for Macaulay 2 (with David Cook II), Summer 2013
Yingyi Shen, Duke University PRUV program - edge toric ideals, Summer 2010-Spring 2012

Academic/Professional service:

Committee on learning goals for new Core Curriculum Quantitative Reasoning requirement - Spring 2016

ND Math Club Faculty mentor - Fall 2016 - present

ND Actuarial Club Faculty mentor - Fall 2014 - present

Glynn Family Honors Program Advisory Board member, Fall 2015 - present

Notre Dame RET (research experience for teachers) co-director, 2013- present

SUMR committee, University of Notre Dame, Spring 2013 - present

Notre Dame College of Science Joint Meeting department representative - Spring 2013 - present

Referred for numerous journals (examples include: Proc. Amer. Math. Soc., J. Commut. Algebra, Journal of Software for Algebra and Geometry, Communications in Algebra, Journal of Pure and Applied Algebra, Graphs and Combinatorics, Journal of Pure and Applied Algebra)

FEMMES capstone event Spring 2011, Duke University. Led sessions titled "Mathematics of the Rubik's Cube" for 5th and 6th grade girls.

Founding member Duke University Mathematics Department "Noetherian Ring"

Graduate Student Representative, Columbia University Mathematics Department, Summer 2005- Summer 2007

Other research experiences:

Summer 2001 Williams College REU, advisor: Susan Loepf