Susan M. Cooper

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Canadian Citizen & Permanent Resident of U.S.A.

Research Interests

Commutative Algebra and Algebraic Geometry.

Education

Ph.D. in Mathematics, Queen's University, 2005
Dissertation: Hilbert Functions of Subsets of Complete Intersections
Advisors: A. Geramita & L. Roberts

M. Sc. in Mathematics, Queen's University, 2000
Thesis: Subsets of Complete Intersections in $\mathbb{P}^2$: Their Hilbert Functions & 2-Type Vectors
Advisors: A. Geramita & L. Roberts

B.Sc. in Mathematics with High Honours, University of Regina, 1998

Academic Positions

Assistant Professor	Central Michigan Univ.	July 2011–Present
Marilyn Hitz Research Asst. Prof.	Univ. of Nebraska–Lincoln	Aug. 2008–July 2011
Assistant Professor	California Polytechnic	Sept. 2006–June 2011
Post-Doctoral Fellow	Syracuse Univ.	Aug. 2005–May 2006

Publications and Preprints

Symbolic Powers of Monomial Ideals (with R. Embree, T. Hà, A. Hoefel), submitted.

Regina Lectures on Fat Points (with B. Harbourne), in press, "Connections Between Algebra, Combinatorics, and Geometry" (S. Cooper, S. Sather-Wagstaff, ed.), Springer PROMS series.

The Alpha Problem and Line Count Configurations (with S. Hartke), Journal of Algebra, v. 407 (2014), pp. 224–245.

Containment Results for Ideals of Various Configurations of Points in $\mathbb{P}^N$ (with C. Bocci and B. Harbourne), Journal of Pure and Applied Algebra, v. 218, issue 1 (2014), pp. 65–75.

Multiplicities & Enumeration of Semidualizing Modules (with S. Sather-Wagstaff), Communications in Algebra, v. 41, issue 12 (2013), pp. 4549–4558.

Recent Developments and Open Problems in Linear Series (with Th. Bauer, C. Bocci, S. Di Rocco, M. Dumnicki, B. Harbourne, K. Jabbusch, A. Knutsen, A. Küronya, R. Miranda, J. Roé, H. Schenck, T. Szemberg, Z. Teitler), "Contributions to Algebraic Geometry, IMPANGA Lecture Notes" (Piotr Pragacz , ed.), EMS Series of Congress Reports, edited by the European Mathematical Society Publishing House, (2012), pp. 93–140.

Subsets of Complete Intersections and the EGH Conjecture, "Progress in Commutative Algebra I: Combinatorics and Homology" (C. Francisco, L. Klingler, S. Sather-Wagstaff, J. Vassilev, ed.), De Gruyter, v. 1 (2012), pp. 167–198.

Combinatorial Bounds on Hilbert Functions of Fat Points in Projective Space (with B. Harbourne and Z. Teitler), Journal of Pure and Applied Algebra, v. 215, issue 9 (2011), pp. 2165–2179.

Algebraic Interpretation of a Theorem of Clements and Lindström (with L. Roberts), Journal of Commutative Algebra, v. 1, no. 3 (2009), pp. 361–380.

The Gale Transform and Multi-Graded Determinantal Schemes (with S. Diaz), Journal of Algebra, v. 319, issue 8 (2007), pp. 3120–3127.

Growth Conditions for a Family of Ideals Containing Regular Sequences, Journal of Pure and Applied Algebra, v. 212, issue 1 (2007), pp. 122–131.

Notes on Integral Closure (with L. Roberts), The Curves Seminar at Queen's, Queen's Papers in Pure and Applied Mathematics, v. 13, no. 119 (2000), pp. 63–101.

Grants and Fellowships

Algebraic and Combinatoric Invariants of Fat Points, **Early Career Grant**, $42,452, Office of Research and Sponsored Programs, Central Michigan University, 2012–2015.

Fat Points and Coding Theory, **NSF Research Experiences for Undergraduates (REU)**, Senior Personnel, Central Michigan University, Summer 2013.

Symbolic Powers of Monomial Ideals, **FRCE Premier Display Grant**, $1,000, Central Michigan University, Spring 2013.

Connections Between Algebra and Geometry, **NSF Conference Award**, $15,340 (DMS–1200313).

Connections Between Algebra and Geometry, **NSA Conference Award**, $15,000 (ID:111011).

Connections Between Algebra and Geometry, **PIMS Conference Award**, $5,000 CDN.

Faculty Center for Innovative Teaching Professional Growth Grant, $573, Central Michigan University, Fall 2012.

Some Containment Results for Fat Points, **FRCE Premier Display Grant**, $1,000, Central Michigan University, Fall 2011.

KUMUNU 2011, **NSF Conference Award**, $17,000 (DMS–1110585).

US Junior Oberwolfach Fellow, $500, under NSF Award DMS–0540019 (attended the mini-workshop Linear Series on Algebraic Varieties, Oct. 2010).

KUMUNU 2009, **NSF Conference Award**, $9,290, (DMS–0940459), co-PI B. Harbourne.

Computing Algebraic Invariants of Fat Points Via Reduction, **AWM–NSF Travel Grant**, $1,400 (attended Joint Meeting of the American & Korean Math. Societies, Seoul, Korea, Dec. 2009).

Hilbert Functions of Special Fat Points, **AWM–NSF Mentoring Travel Grant**, $3,050 (visited B. Harbourne, Univ. of Nebraska–Lincoln, July 2007).

Combinatorial, Geometric and Algebraic Aspects of Hilbert Functions, **Edinburgh Mathematical Society** and the **Glasgow Mathematical Journal**, £1,870 (visited L. O'Carroll, University of Edinburgh, Aug. 2007).

Geometric Consequences of the Eisenbud-Green-Harris Conjecture, **State Faculty Support Grant**, California Polytechnic State Univ. (received a 4-unit course reduction).

Academic and Teaching Awards

Honorable Mention, Outstanding Postdoc Award, Univ. of Nebraska–Lincoln, 2010.
1 award and 5 honorable mentions given campus-wide.

Parents Assn. Award: Recognition for Contributions to Students, U. of Nebraska–Lincoln, 2008.
Award based on recommendations from parents in consultation with their children.

Golden Apple Teaching Award, Engineering Society, Queen's Univ., 2005.
4 awards given annually based on nominations by Engineering students.

1st Year Applied Science Teaching & Learning Award, Queen's Univ., 2005.
2 annual awards given for contributions to creating a good teaching & learning environment.

Plenary Lectures, Colloquia, and Workshops Instructed

Monomial Ideals, Symbolic Powers, and a Polyhedron, Interactions Between Commutative Algebra and Algebraic Geometry II, Tulane University, Sept. 2013.

A Macaulay-Characterization for Fat Points?, Michigan Computational Algebraic Geometry Conference, Western Michigan University, May 2013.

The Perplexing Hilbert Functions of Fat Points, Interactions Between Commutative Algebra and Algebraic Geometry (in Honour of Tony Geramita), Queen's University, Oct. 2012.

Fat Points and Symbolic Powers, Problem Session Assistant (Instructor: B. Harbourne, Univ. of Nebraska–Lincoln), Connections Between Algebra & Geometry, U. of Regina, Summer 2012.

Conway's Mathematical Games, Kappa Mu Epsilon Initiation, Central Michigan University, April 2012.

Trimming Fat Points, Plenary Lecture, Prairie Network for Research in the Mathematical Sciences (PNRMS) Annual Meeting, University of Regina, May 2011.

A Survey of Macaulay's Theorem, Workshop Lecture, PNRMS Meeting, U. of Regina, May 2011.

Powerful Invariants of Points, Colloquium, University of Mississippi, Nov. 2010.

Generalizations & Consequences of Macaulay's Theorem, Colloquium, University of Nebraska–Lincoln, Oct. 2008.

Hilbert Functions of Fat Points, Colloquium, California Polytechnic State Univ., Nov. 2007.

Selected Invited Presentations

Complete and Partial Intersections, Special Session: Interactions Between Commutative Algebra and Algebraic Geometry, American Mathematical Society (AMS) Sectional Meeting, Texas Tech University, April 2014.

Containment Problems for Monomial Ideals, Special Session: Combinatorial Commutative Algebra, AMS Sectional Meeting, University of Louisville, Oct. 2013.

Symbolic Powers of Monomial Ideals, Special Session: Commutative Algebra and Combinatorics, Canadian Mathematical Society (CMS) Summer Meeting, Dalhousie Univ., June 2013.

Partial Intersections and Fat Points, Special Session: Commutative Algebra, AMS Sectional Meeting, University of Mississippi, March 2013.

Bringing Real-Life Mathematics to a Fifth Grade Classroom (with K. Hall), 2012 Regional Conference, National Council of Teachers of Mathematics (NCTM), Chicago, Nov. 2012.

Fat Points on Grids, Special Session: Combinatorial Commutative Algebra, AMS Sectional Meeting, Tulane University, Oct. 2012.

Bounding the Alpha Invariant for Fat Points, Special Session: Combinatorial Commutative Algebra, AMS Sectional Meeting, University of Kansas, April 2012.

Measuring the Difference Between Symbolic and Regular Powers, Commutative Algebra Seminar, University of Michigan, March 2012.

The Alpha Problems for Fat Points, Algebra Seminar, Tulane University, Jan. 2012.

Some Containment Results for Fat Points, Special Session: Algebraic Geometry & Commutative Algebra, CMS Winter Meeting, Ryerson & York Universities, Dec. 2011.

A Mathematician, A Teacher, and A Fifth Grader - Oh My!, Issues in Math. and Science Education Seminar, University of Nebraska–Lincoln, April 2011.

Relating Initial Degrees of Symbolic and Regular Powers, Special Session: Local Commutative Algebra, Joint Mathematics Meetings, Jan. 2011.

Hilbert Functions and Initial Degrees of Fat Points, Linear Series on Algebraic Varieties, Mathematisches Forschungsinstitut Oberwolfach, Oct. 2010.

Reduced vs Non-Reduced Points–A Score Sheet for Invariants, Algebra Seminar, Syracuse Univ., March 2010.

Invariants Related to Symbolic Powers of Ideals of Points, Algebra Seminar, Univ. of Kansas, Feb. 2010.

Careers Using Math., Nebraska Conference for Undergraduate Women in Math., Univ. of Nebraska–Lincoln, Jan. 2010 (panelist).

Computing Algebraic Invariants of Fat Points Via Reduction, Special Session: The Geometry of Varieties, Syzygies and Computations, Intl. Joint Meeting of the AMS & KMS, Seoul, Korea, Dec. 2009.

Short Exact Sequences Related to Trimming Fat Points Via Lines, ASARC Seminar, Korea Advanced Institute of Science and Technology (KAIST), Dec. 2009.

Tearing Down Fat Point Schemes, Special Session: Graded Resolutions, AMS Sectional Meeting, Florida Atlantic University, Oct. 2009.

Mathematical Careers, IMMERSE Program, Univ. of Nebraska–Lincoln, July 2009 (panelist).

In Search of Exactness, Joint Maximals Seminar, University of Edinburgh, March 2009.

Hilbert Functions of Fat Points, Connections for Women: Algebraic Geometry & Related Fields, Mathematical Sciences Research Institute (MSRI), Jan. 2009 (poster).

Bounding Hilbert Functions of Fat Points, Special Session: Commutative Algebra and Algebraic Geometry, CMS Winter Meeting, Carleton University, Dec. 2008.

Investigating Macaulay's Theorem, Algebra Seminar, Texas Tech University, Oct. 2008.

Bézout Vectors & Fat Points, Algebra Seminar, University of Texas–Arlington, Oct. 2008.

What is a Hilbert Function?, AGANT Seminar, University of North Texas, Oct. 2008.

Bounding Hilbert Functions of Fat Points, KUMUNU '08, Univ. of Nebraska–Lincoln, Sept. 2008.

The Gale Transform & Multi-Graded Determinantal Schemes, Special Session: Algebraic Geometry of Matrices & Determinants, AMS Sectional Meeting, Louisiana State Univ., March 2008.

Characterizing Hilbert Functions of Fat Points, Special Session: Progress in Commutative Algebra, Joint Mathematics Meetings, Jan. 2008.

The Eisenbud-Green-Harris Conjecture & Projective Space, Algebra Seminar, Tulane U., Nov. 2007.

Line Count Configurations and Fat Points, Special Session: Free Resolutions, AMS Sectional Meeting, DePaul University, Oct. 2007.

Counting Macaulay-Style, New York State Regional Graduate Mathematics Conference, Syracuse University, April 2006.

The Lex-Plus-Powers Conjecture for Points, Special Session: Hilbert Functions & Resolutions, AMS Sectional Meeting, San Francisco State University, April 2006.

Hilbert Functions of Subsets of Complete Intersections in $\mathbb{P}^n$, Special Session: Commutative Algebra, Joint Mathematics Meetings, Jan. 2005.

Invited Conference and Workshop Participation

Combinatorial Commutative Algebra and Applications, Mathematical Sciences Research Institute (MSRI), Dec. 2012.

Enacting Standards for Mathematical Practices, Univ. of Nebraska–Lincoln, Oct. 2011.

Linear Series on Algebraic Varieties, Mathematisches Forschungsinstitut Oberwolfach, Oct. 2010.

Connections for Women: Algebraic Geometry and Related Fields, MSRI, Jan. 2008.

Syzygies & Hilbert Functions, Banff International Research Station (BIRS), Oct. 2006.

Syzygies, Hilbert Functions & Generic Initial Ideals, Scuola Matematica Interuniversitaria, Cortona, Italy, July 2006.

Introductory Workshop in Commutative Algebra, MSRI, Sept. 2002.

Refereeing and Reviewing

Illinois Journal of Mathematics.

Rocky Mountain Journal of Mathematics.

Journal of Pure and Applied Algebra.

Journal of Commutative Algebra.

Vietnam Journal of Mathematics.

Zentralblatt MATH.

American Mathematical Monthly.

Editing

Connections Between Algebra, Combinatorics, and Geometry, Springer Proceedings in Mathematics and Statistics (PROMS), co-editor, projected to appear 2014.

Conference and Special Sessions Organization

Conversations Among Colleagues, Making Practice Core: Mathematical Practices and the Practice of Teaching, Central Michigan University, March 2013.

Further Connections Between Algebra & Geometry, North Dakota State Univ., Feb. 2013.

Special Session: Interactions Between Algebraic Geometry and Commutative Algebra, Canadian Mathematical Society (CMS) Summer Meeting, Univ. of Regina, June 2012.

Connections Between Algebra & Geometry, Graduate Workshop, U. of Regina, Summer 2012.

Special Session: Algebraic Geometry and Graded Commutative Algebra, American Mathematical Society (AMS) Sectional Meeting, Univ. of Nebraska–Lincoln, Oct. 2011.

KUMUNU 2011, a regional conference on Commutative Algebra & Related Fields, April 2011.

Special Session: Commutative Algebra, Joint Mathematics Meetings, Jan. 2010.

KUMUNU 2009, a regional conference on Commutative Algebra & Related Fields, Sept. 2009.

Special Session: Hilbert Functions & Resolutions, AMS Sectional Meeting, Univ. of British Columbia, Oct. 2008.

Connecting Women in Math Across Canada, University of Alberta, June 2003.

Route 81 Conference on Commutative Algebra & Algebraic Geometry, Queen's Univ., Fall 2002.

Seminar and Colloquium Organization

Colloquium Committee Chair, Dept. of Math., Central Michigan University, Aug. 2012–Present.

Graduate Student Seminar, Dept. of Math., Central Michigan University, Aug. 2012–Present.

Algebra Learning Seminar, Dept. of Math., Central Michigan Univ., Aug. 2012–Present.

Algebraic Geometry Seminar, University of Nebraska–Lincoln, Jan. 2009–April 2011.

Pi Mu Epsilon Annual Lecture, Math Club, University of Nebraska–Lincoln, April 2009.

Algebra Seminar, California Polytechnic State University, Sept. 2006–June 2008.

Graduate Student Seminar, Queen's University, Sept. 2000–April 2003.

Instructional Activities

Writing Generally in Every Discipline Workshop, California Polytechnic State Univ., 2006.

Co-author of linear algebra (APSC 174) course notes, Queen's University, 2003–2005.

SGS 901–Teaching and Learning in Higher Education. Semester course, Queen's Univ., 2003.

Program in University Teaching & Learning. Certificates in: Scholarship; Practical Experience; Professional Development. Instructional Development Centre, Queen's Univ., May 2003.

Supervision of Students

Linda Anderson, Internship for Linear Algebra (MTH 223), Central Michigan Univ., Fall 2013.

Daniel Carmody (Indiana U.), Nicholas Cripsi (CUNY), Marie Ermete (Central Michigan U.), NSF-REU Program, Central Michigan University, Summer 2013.

Jeffrey Fujioka, Graduate Research Assistant, Central Michigan Univ., Fall 2012–Spring 2013.

Jeffrey Conner, Plan B Master's Paper *Bounding Geometric Invariants Using Coding Theory*, Central Michigan University, Spring 2013.

Jeffrey Fujioka, Plan B Master's Paper *Hilbert Functions of Complete Intersections*, Central Michigan University, Spring 2013.

Jason Pode, Plan B Master's Paper *Connecting Graph Theory and Commutative Algebra via Ideals*, Central Michigan University, Spring 2013.

Cleland Loszewski, Internship for Linear Algebra (MTH 223), Central Michigan U., Spring 2012.

Megan Stobel, Master's Paper *Flipping Triangles*, University of Nebraska–Lincoln, Spring 2011.

Jordan Wiebe, Honors Project in Group Theory, University of Nebraska–Lincoln, Spring 2011.

Mary B. Kilnoski, Master's Paper *The Mathematics of the Five Card Trick*, Univ. of Nebraska–Lincoln, Summer 2010.

Courses Taught

Central Michigan Univ.	Theory of Numbers (MTH 521)	F 2013
	Calculus I (MTH 132)	Sp 2013
	Theory of Associative Rings (MTH 625)	F 2012
	Theory of Groups (MTH 623)	Sp 2012
	College Geometry (MTH 341)	F 2011
Univ. of Nebraska–Lincoln	Number & Operation for K–3 Specialists (Math 800P)	Su 2011
	Intro. to Modern Algebra I (Math 417)	Sp 2011
	Mathematics Matters (Math 300)	F 2010
	The Power of Monomial Ideals (Math 918)	Sp 2010
	Geometry of Schemes (Math 997)	Su 2009, Sp 2010
	Experimentation, Conj. & Reasoning (Math 804T)	Su 2009, 2010
	Joy of Numbers (Math 189H)	F 2009
	Using Math. to Understand Our World (Math 807T)	Sp 2009
	Matrix Theory (Math 314/814)	F 2008
California Polytechnic State Univ., San Luis Obispo	Methods of Proof in Math. (Math 248)	Sp 2008
	Linear Algebra III (Math 406)	W 2008
	Linear Algebra II (Math 306)	F 2007
	Linear Algebra I (Math 206)	Sp 2007
	Calculus III (Math 143)	Sp 2007
	Calculus II (Math 142)	F 2006, W 2007, 2008
	Calculus I (Math 141)	F 2006, 2007
Syracuse Univ.	1st Course in Linear Algebra (MAT 331)	Sp 2006
	Calculus I (MAT 295)	F 2005, Sp 2006
Queen's Univ.	Intro. Linear Algebra for Eng. Students (APSC 174)	W 2003, 2004, 2005
	Differential and Integral Calculus (Math 121)	F 2001, W 2005

K–12 Mathematics Education Activities

Math in the Middle Institute Partnership: This is an NSF-funded Math Science Partnership at the University of Nebraska–Lincoln. In the program middle-level teachers (grades 5–8) from across Nebraska work towards a master's degree. Via this program I have been involved in the following:

- Taught *Using Math to Understand Our World* (Math 807T). The course is a full-semester, applied mathematics, project-based, distance course.
- Modified the full-semester course *Experimentation, Conjecture, and Reasoning* (Math 804T) for an intense summer session. I taught this course in Summers 2009 and 2010.
- Teachers in the program are required to write an expository paper. I designed two topics (*The Mathematics of the Five Card Trick* and *Flipping Triangles*) and advised the teachers (M. B. Kilnoski and M. Stobel) working on the papers in Summer 2010 and Spring 2011.
- I worked with 5th grade teacher K. Hall to incorporate projects from Math 807T into her class.

Center for Science, Mathematics and Computer Education: In Fall 2010–Summer 2011 I held a joint position between the University of Nebraska–Lincoln's Department of Mathematics and the Center for Science, Mathematics and Computer Education. My activities involved various projects with both K–12 teachers and faculty from other disciplines. Activities included:

- **The Mathematics Semester** for pre-service elementary teachers. This is a unique integration of a mathematics course, a pedagogy course, and practical experience. Joint with M. Ding, R. Heaton from the Dept. of Teaching, Learning, and Teacher Education & J. Lewis from the Dept. of Math., I researched how to further develop this semester both for improving mathematics teacher training and building a strong partnership between a mathematician and mathematics educator.
- Organizing a Teachers' Circle in Omaha, Nebraska. The goal for this activity is to regularly bring together teachers and mathematicians to explore deep yet accessible mathematics.
- Taught the course *Number and Operation for K–3 Math Specialists* (Math 800P). This course is part of the NSF-grant funded program **Primarily Math** and has an audience of in-service teachers.

Other Service Activities

First Year Experience Advisory Council Member, Academic Senate, Central Michigan Univ., August 2013–August 2016.

Degrees, Admissions, Standards, and Honors Committee Member, Academic Senate, Central Michigan Univ., Aug. 2012–Aug. 2015.

Graduate Committee, Department of Math., Central Michigan Univ., Fall 2013–Spring 2015.

Faculty Advisor, Dept. of Math., Central Michigan University, Spring 2012–Present.

Department of Mathematics Liaison with the Association for Women in Mathematics (AWM), Central Michigan University, Sept. 2012–Present.

Department of Mathematics Liaison with the Mathematical Association of America (MAA), Central Michigan University, Sept. 2011–Present.

Faculty Advisor for "On the Rox" (a cappella group), Central Michigan U., Aug. 2012–Present.

Algebra Qualifying Exam Committee Member, Central Michigan University, Jan. 2012, Jan. 2013 (chair), Aug. 2013 (chair).

Marketing Task Force Member, College of Science and Technology, Central Michigan Univ., Aug. 2012–Spring 2013.

Chair Review Committee Member, Dept. of Math., Central Michigan Univ., Spring 2013.

Faculty Assistant, Graduate Assistant Teaching Workshop, Dept. of Math., Central Michigan Univ., Aug. 2012. (Lead the session entitled *Balancing Teaching and Studying: The Life of a Graduate Student*.)

Scholarships & Awards Committee Member, Department of Mathematics, Central Michigan University, Sept. 2011–Aug. 2012.

Faculty Program organizer, Nebraska Conference for Undergraduate Women in Math., Univ. of Nebraska–Lincoln, Jan. 2010 and Jan. 2011.

Algebra Grad. Exam Committee Member, California Polytechnic State U., Sept. 2006–June 2008.

Organizer of Teacher Session for the Sonia Kovalevsky Festival, Syracuse Univ., Oct. 2005.

TA Mentor/Liaison, Queen's University, Sept. 2004–April 2005.

Organizer of Marking Session, Teaching Assistant Workshop, Queen's University, Sept. 2004.

Student Committee Co-chair, Canadian Mathematical Society (CMS), July 2002–June 2004.

CMS Board Member, Jan. 2000–June 2004.

CMS Student Committee Member, 1998–2004.

Member of the Math Headship Committee, Queen's University, Fall 2003.

Co-organizer of the Teaching Assistant Workshop, Queen's University, Sept. 2001 and 2002.

Co-organizer of day math camps for elementary-school students, Queen's U., June 2000 & 2001.

CMS Judge, Canada-Wide Science Fair, Queen's University, May 2001.

Student Representative, Dept. of Mathematics & Statistics, University of Regina, 1997–1998.

Professional Memberships

American Mathematical Society (AMS).

Association for Women in Mathematics (AWM).

Canadian Mathematical Society (CMS).

Mathematical Association of America (MAA).

Pacific Institute for the Mathematical Sciences (PIMS).