

Katharine Shultis

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EDUCATION

- Ph.D. Mathematics**, University of Nebraska-Lincoln **2015**
Thesis Title: *Systems of parameters and the Cohen-Macaulay property*
Thesis Advisors: Srikanth Iyengar, Roger Wiegand
- M.A. Mathematics**, University of California, San Diego **2009**
- B.A. Mathematics, Chemistry**, Scripps College **2007**
Graduated *Cum Laude*
Budapest Semesters in Mathematics program, 2005
Mathematics Thesis Title: *Classes and Genera of Integral Binary Quadratic Forms*
Mathematics Thesis Advisor: Christopher Towse
Chemistry Thesis Title: *A ³¹P NMR Study of DNA Dynamics and Methylation*
Chemistry Thesis Advisor: Mary Hatcher-Skeers

EMPLOYMENT

- Department of Mathematics, Gonzaga University (GU)**
Assistant Professor, 2015-present
- Department of Mathematics, University of Nebraska-Lincoln (UNL)**
Graduate Teaching Assistant, 2010-2015
- Department of Mathematics, University of California, San Diego (UCSD)**
Graduate Teaching Assistant, 2007-2010
- Scripps College**
Tutor and Grader, 2004-2007

AWARDS AND FELLOWSHIPS

- McDonald Work Award - Networks** **2019-2020**
With Dr. Hays Whitlatch, I was awarded a McDonald Work Award for \$1913 to pay students working on our research project. We are supporting 2 students this academic year.
- McDonald Work Award - Polygons** **2017-2019**
With Dr. Jason Lutz, I was awarded McDonald Work Awards totaling \$3413 to pay students working on our research project. We supported a total of 5 students over 4 semesters.
- Summer Research Funds** **2017, 2018**
With Dr. Jason Lutz, I was awarded a total of \$5000 from the Dean's office and Mathematics Department for summer support for our student research projects across two summers. These funds paid both faculty members and one student each summer.

Center for Teaching and Advising (CTA) Travel Grant 2017

I was awarded a CTA travel grant to help support travel to the MAA MathFest held in Chicago, IL in July 2017 where I presented on my work obtaining the Writing Enriched designation for my Fundamentals of Mathematics course.

Speaker Series Funds 2016

As Invited Program Coordinator for the PNW MAA Planning Committee, I applied for, and was awarded, speaker series funds to help support John Milton's visit to Spokane in June 2017. John is a professor of Neuroscience and gave a mini-course and plenary talk on Inquiry Based Learning. Both were made freely available to non-mathematics GU faculty.

CTA Travel Grant 2016

As Invited Program Coordinator for the PNW MAA Planning Committee, I applied for, and was awarded, a CTA travel grant to help support Stan Yoshinobu's visit to Spokane in June 2017. Stan is the director of the Academy of Inquiry Based Learning, and gave a workshop and plenary talk on his work in mathematical neuroscience. The plenary talk was open to the public.

Mathematics Research Community, follow-up funding 2016

Dr. Peder Thompson visited Spokane, WA in May 2016 for work on our continued research project. We successfully applied to the MRC program for a collaboration grant to support his travel.

Project NExT, Mathematical Association of America 2015-present

A professional development program for new or recent Ph.D.s in the mathematical sciences.

Graduate Assistance in Areas of National Need (GAANN) Fellowship 2014-2015

Awarded by the mathematics department, this U.S. Department of Education fellowship provides extra time during the academic year to focus on course work and research.

San Diego Fellowship 2007-2008

A university-wide fellowship granted to incoming graduate students at the University of California - San Diego to recognize academic excellence and promote diversity.

Goldwater Scholarship 2006-2007

The Barry M. Goldwater Scholarship and Excellence in Education Foundation grants merit scholarships to mathematics, science, and engineering students as a recognition of their potential to make significant contributions to the scientific research community. (<http://www.act.org/goldwater/>)

James E. Scripps Scholarship 2003-2007

The James E. Scripps Scholarship is offered by Scripps College to entering students based on academic performance, extracurricular involvement, and personal qualities.

PUBLICATIONS

L. Kniahnitskaya, O. Ramirez, M. Ortiz, K. Shultis, H. Whitlatch *Monitoring Power Networks*. (in progress)

V. Coufal, K. Shultis, *Calculus II IBL Materials*. (submitted)

K. Shultis, P. Thompson, *Reducibility of parameter ideals in low powers of the maximal ideal*. (submitted)

T. DeGiovanni, J. Lutz, K. Shultis, *Most Economical Common Dissection of a Square and Equilateral Triangle*. (submitted)

K. Shultis. Systems of parameters and the Cohen Macaulay property. *J. Commut. Algebra*, 10(1):139-151, 2018.

Y. Tian, M. Kayatta, K. Shultis, A. Gonzalez, L. J. Mueller, M. E. Hatcher. ³¹P NMR Investigation of Backbone Dynamics in DNA Binding Sites. *The Journal of Physical Chemistry B* **113** (2009), no. 9, 2596-2603, DOI 10.1021/jp711203m.

PRESENTATIONS

Invited Research Talks

- AMS Sectional Meeting, Madison, WI
Reducibility of parameter ideals in low powers of the maximal ideal, September 2019
- University of Idaho Colloquium, Moscow, ID
Reducibility of parameter ideals in low powers of the maximal ideal, April 2019
- AMS Sectional Meeting, Portland, OR
Reducibility of parameter ideals in low powers of the maximal ideal, April 2018
- AMS Sectional Meeting, Pullman, WA
Systems of parameters and the Cohen-Macaulay property, April 2017
- University of Montana Colloquium, Missoula, MT
Systems of parameters and the Cohen-Macaulay property, March 2017
- AMS Sectional Meeting, Fullerton, CA
Systems of parameters of modules and the Cohen-Macaulay property, October 2015
- KUMUNUjr, Lincoln, NE
Systems of parameters of modules and the Cohen-Macaulay property, April 2015
- AMS Sectional Meeting, Washington, DC
Systems of parameters and the Cohen-Macaulay property, March 2015
- KUMUNUjr, Lincoln, NE
Systems of parameters and the Cohen-Macaulay property, April 2014
- KUMUNUjr, Lincoln, NE
Free Resolutions and Sparse Determinantal Ideals - Part I, April 2013

Teaching Workshops

- Gonzaga University, CTA Teaching Workshop, Spokane, WA
 Co-led with N. Calkins, K. Kearney, *Writing Enriched Designation*, April 2019
- Pacific Northwest MAA Section Meeting, Spokane, WA
 Co-led with V. Coufal, *IBL Roundtable Discussion*, June 2017
- Pacific Northwest Section NExT Workshop, Corvallis, OR
 Co-led with V. Coufal, *Experiences in POGIL-ish Calculus*, April 2016
- Gonzaga University, CTA Teaching Workshop, Spokane, WA
 Co-led with V. Coufal, A. Shuster, *Inquiry Based Learning*, March 2016

Contributed Talks

- PNW MAA Section Meeting, Portland, WA
Reducibility of parameter ideals in low powers of the maximal ideal, April 2019
- PNW MAA Section Meeting, Seattle, WA
(Writing Enriched) Introduction to Proofs, April 2018
- MAA MathFest, Chicago, IL
(Writing Enriched) Introduction to Proofs, July 2017
- PNW MAA Section Meeting, Corvallis, OR
Systems of parameters and the Cohen-Macaulay property, April 2016
- Young Mathematicians Conference, Columbus, OH
Asymptotics on the Class Number, Joint with L. Kennard, August 2006

Talks For Young Mathematicians

- Gonzaga University Math Club, Spokane, WA
Equidecomposability of Polygons, March 2017

Scripps College Math Club, Claremont, CA
Equidecomposability of Polygons, October 2015

Concordia University Math Club, Irvine, CA
Equidecomposability of Polygons, October 2015

UNL Math Club, Lincoln, NE
Equidecomposability of Polygons, February 2015

MathILY “Daily Gather”, Philadelphia, PA
Polynomial Genocide, August 2014

Seminar Talks at UNL

Commutative Algebra Seminar

Systems of parameters and the Cohen-Macaulay property, April 2014

Commutative Algebra Reading Seminar (CARS)

Principal Systems, January 2014

The Tools from Croll’s 2013 paper “Periodic Modules over Gorenstein Local Rings”, September 2013

Tropical Geometry, March 2013

Algebraic Statistics Continued: Toric Models, January 2013

Commutative Algebra 101: A “Categorical” and In-“Depth” Approach, September 2012

The Rigidity of the Koszul Complex, February 2012

On a paper: “A Generalization of a Theorem of M. Auslander” by Kalus Bongartz, December 2011

Graduate Student Seminar

What’s so magic about squares?, January 2013

Gelfand-Kirillov Dimension and the Bergman Gap Theorem, February 2011

Seminar Talks at the University of Utah

Bridge Into Knowledge, E.g., the knowledge of commutative algebra Seminar (BIKES)

Systems of parameters and the Cohen-Macaulay property, December 2014

Seminar Talks at UCSD

Algebra Student Seminar

The Bergman Gap Theorem, April 2009

Food For Thought Seminar

Gelfand-Kirillov Dimension and the Bergman Gap Theorem, October 2009

Invited Panelist

NCUWM, *Choosing a Mathematics Graduate Program*, 2015

IMMERSE, *How to survive your first year of graduate school*, 2014

IMMERSE, *Surviving Graduate School*, 2013

IMMERSE, *What to expect in your first year of graduate school*, 2012

IMMERSE, *Succeeding in Graduate School*, 2011

UCSD Undergraduate Math Conference, *Undergraduate Opportunities in Mathematics*, 2010

UCSD AWM Event, *Math After UCSD Panel*, 2009

UCSD AWM Event, *Academic Opportunities for Undergraduates*, 2008

CONFERENCES, WORKSHOPS, AND SUMMER SCHOOLS

Workshops and Summer Schools Attended by Invitation

Academy of Inquiry Based Learning

IBL Workshop, June 2016

American Mathematical Society

Mathematics Research Community, Commutative Algebra, June 2015

University of California, Berkeley

Macaulay2 Workshop, January 2014

University of Washington

Seattle Summer π -School: Summer School, July 2012

Workshop: Cohomology and Support in Representation Theory and Related Topics, August 2012

Conference Sessions and Workshops Organized

Project NExT Session Organizer, PNW MAA Section Meetings

Co-organizer with M. K. Kearney (GU), *Mentoring Groups*, April 2019

Co-organizer with M. K. Kearney, *Hiring Policies and Procedures Panel*, April 2018

Pacific Northwest MAA Session Organizer, PNW MAA Section Meeting

Co-organizer with M. K. Kearney, *Algebra and Topology*, April 2019

Co-organizer with M. K. Kearney, *Junior Faculty Research*, April 2016

Special Session Organizer, AMS Spring Western Sectional Meeting

Co-organizer with J. Lutz (GU), *Special Session on Commutative Algebra*, April 2017

Project NExT Session Organizer, Joint Mathematics Meetings

Co-organizer with J. Curry, S. Jensen, B. Schleben, *Designing an Original Course*, January 2016

Additional Conferences and Workshops Attended

Nebraska Conference for Undergraduate Women in Mathematics, Lincoln, NE, January 2020, 2019, 2018, 2017

CUR Business Meeting and Undergraduate Research Programs Conference, Columbus, OH, June 2019

National Inquiry-Based Learning & Teaching Conference, Denver, CO, June 2019

Constructing the Future of IBL Conference: The Past 20 Years and the Next 20 Years, Chicago, IL, July 2017

MAA MathFest, Columbus, OH, August 2016

Legacy of R.L. Moore - IBL Conference, Columbus, OH, August 2016

Commutative Algebra and its Interactions with Algebraic Geometry: Tight Closure, Linkage, and Syzygies, University of Michigan, July 2016

GU CTA Workshop *Slow Teaching in a Fast Age: 12 Active Learning Approaches for Teaching*, February 2016

Joint MAA-AMS Meetings, Seattle, WA, January 2016

MAA MathFest, Washington, DC, August 2015

Legacy of R.L. Moore - IBL Conference, Austin, TX June 2015

KUMUNUjr (Conference in Algebra), University of Nebraska - Lincoln, April 2015, 2014, 2013, 2012

RTG Local Cohomology Workshop, University of Illinois - Chicago, February 2015

Joint MAA-AMS Meetings, San Antonio, TX, January 2015

KUMUNU (Conference in Algebra), University of Missouri - Columbia, September 2014, 2013, 2012

AMS Sectional Meeting, University of Wisconsin - Eau Claire, September 2014

Legacy of R.L. Moore - IBL Conference, Denver, June 2014
 AMS Sectional Meeting, Iowa State University, April 2013
 MSRI Workshop: Representation Theory, Homological Algebra, and Free Resolutions, Berkeley, CA, February 2013
 Joint MAA-AMS Meetings, Boston, MA, January 2012
 AMS Sectional Meeting, University of Nebraska - Lincoln, October 2011
 KUMUNU (Conference in Algebra), University of Nebraska - Lincoln, April 2011
 MAA Sectional Meeting, Harvey Mudd College, April 2010
 Southern California Women in Mathematics Symposium, University of Southern California, February 2010
 Joint MAA-AMS Meetings, San Francisco, CA, January 2010
 Southern California Women in Mathematics Symposium, Loyola Marymount University, April 2009

TEACHING EXPERIENCE

Gonzaga University, primary instructor

Fundamentals of Mathematics Spring 2020, Spring 2017
With the writing enriched designation, a course teaching methods of mathematical proofs.

Calculus-Analytic Geometry III Spring 2020, Fall 2018
A multivariable calculus course, including vector calculus.

Calculus-Analytic Geometry II Fall 2019, Spring 2018, Spring 2017, Fall 2016, Spring 2016
An integral calculus course, including applications and sequences/series.

Excursions in Mathematics Fall 2019
A course in mathematics for students majoring in the liberal arts.

Precalculus Spring 2019
A course in algebra and trigonometry intended to prepare students for calculus.

Calculus-Analytic Geometry I Spring 2019, Fall 2017, Fall 2015
A differential calculus course with introductions to limits and integration.

Senior Comprehensive Fall 2018
A comprehensive survey of mathematics preparing students to present to the faculty and take the MFT.

Statistics for Experimentalists Summer 2018
An applied statistics course for those with calculus preparation.

Introductory Statistics Summer 2018
A first course in statistics that satisfies the Core Mathematics requirement.

Abstract Algebra II Spring 2018
A continuation of Abstract Algebra I.

Abstract Algebra I Spring 2018, Fall 2017
A first semester course in abstract algebra with topics in fields, rings, and groups.

Ordinary Differential Equations Summer 2017
A first course in ordinary differential equations.

Linear Algebra Spring 2016, Fall 2015
A systematic study of matrices, vector spaces, and linear transformations.

All Girls/All Math Summer Camp, course instructor

Codes and Cryptology Summer 2019
A week-long summer math camp for high school girls interested in mathematics.

University of Nebraska-Lincoln, primary instructor

Introduction to Modern Algebra Spring 2014
A proof based first abstract algebra course focusing on concrete examples of rings.

Mathematics Matters Fall 2013
A foundational mathematics course for elementary education majors.

Calculus III Spring 2013, Fall 2012
A multivariable and vector calculus course.

Contemporary Mathematics Fall 2011
A quantitative reasoning course; topics include statistics, probability, voting theory, and graph theory.

College Algebra Spring 2011, Fall 2010
A course on polynomial, rational, logarithmic, and exponential functions.

Saint Francis High School, Mountain View, CA, primary instructor

Geometry Summer 2009
A summer high school course on Euclidean geometry.

University of Nebraska-Lincoln, teaching assistant

Calculus II EXCEL Spring 2012
An integral calculus course. This longer recitation focused on solving problems in small groups.

Algebra II, grader Spring 2012
The second semester graduate algebra course.

Calculus I Summer 2010
A differential calculus course

University of Nebraska-Lincoln, instructional team

Number and Operation for K-3 Mathematics Specialists Summer 2013
A course for in-service elementary teachers focusing on understanding integer operations.

Geometry, Measurement, & Algebraic Thinking for K-3 Math Specialists Summers 2013, 2011
A course for in-service elementary teachers focusing on geometry and algebraic thinking.

Algebra for Algebra Teachers Summer 2012
A course for in-service algebra teachers on the algebra of the integers.

Number, Geometry, and Algebraic Thinking for K-3 Mathematics Specialists Summers 2012, 2011
A course for in-service elementary teachers expanding on geometry and algebraic thinking.

University of California - San Diego, teaching assistant

Calculus I Fall 2009, Fall 2007
A differential calculus course.

Algebra Spring 2010, Winter 2010, Fall 2009
The first year graduate algebra sequence.

Calculus III Winter 2010, Summer 2008
An introduction to calculus of functions of multiple variables.

History of Mathematics Spring 2009
A course on ancient through more recent mathematical ideas and development.

Mathematical Reasoning Winter 2009
An introduction to proofs course focusing on number theory.

Other Teaching Experiences

Grader and Tutor (Scripps College, Joint Science Department of the Claremont Colleges) 2004-2007
I graded and tutored in both mathematics and chemistry. The tutoring was done both in a tutoring center and in individual sessions.

SERVICE

Broader Community

Council on Undergraduate Research (CUR) Councilor, July 2019-present

Successful Women: The expectation, not the exception, Essay for Suffrage & Solidarity - Reflections from Faculty, September 2019

Gonzaga University

Honors Advisory Board, October 2018-present

Academic Standing Committee, September 2018-present

Core Executive Committee, April 2017-present

Honors Curriculum Committee, January 2019-November 2019

College of Arts and Sciences, Gonzaga University

Curriculum Committee, May 2016-May 2018; *Chair May 2017-May 2018*

Teaching Assessment Committee, October 2016-May 2016

Mathematics Department, Gonzaga University

Awards Committee, September 2019-present

Online Summer Courses Development Committee, September 2019-present

Calculus Committee, September 2015-present; *Chair December 2018-present*

Hiring Committee, September 2018-March 2019

Committee to Review the Mathematics Major, September 2015-September 2018

Major Assessment Committee, September 2015-May 2017

Planning Committee for the 2017 PNW MAA Section Meeting, September 2015-July 2017

Hiring Committee, September 2015-March 2016

Commutative Algebra Reading Seminar, University of Nebraska - Lincoln

Co-organizer with P. Thompson, May 2014-May 2015

Co-organizer with H. Lindo, May 2013-May 2014

Graduate Student Association, University of Nebraska - Lincoln

Vice Chair of Finance, April 2013-May 2015

Award for Outstanding Legislative Assembly Representative, April 2013

Legislative Assembly Representative, March 2011-April 2013

Quality of Life Committee Chair, August 2011-April 2012

Association for Women in Mathematics Student Chapter, UCSD

President, July 2009-June 2010

Annual Math Day, University of Nebraska - Lincoln

Math Bowl Timer, Math Bowl Moderator, Skit, Command Center, 2010-2014

University of Nebraska - Lincoln Mathematics Department Orientation

Co-organizer with A. Windle, August 2014

Co-organizer with H. Lindo, August 2013

Scripps College Admissions Office

Alumnae Interviewer, August 2010-present

Alumnae Volunteer, August 2007-present

Student Volunteer, August 2003-May 2007

ADVISING

Awards Won by Undergraduate Research Students

Trent DeGiovanni; *Best Presentation on Original Research*

Trent was awarded the Best Presentation on Original Research award by the Council on Undergraduate Research for his talk at the 2017 National Pi Mu Epsilon conference.

Presentations by Undergraduate Research Students

Hannah Tolson; *Pentagon to square: the most efficient way to transform one polygon to another*
Nebraska Conference for Undergraduate Women in Mathematics, Lincoln, NE, January 2018

Trent DeGiovanni; *Most Economical Common Dissection of a Square and Equilateral Triangle*

Northwest Undergraduate Mathematics Symposium, Linfield College, April 2017

Spokane Intercollegiate Research Conference, Gonzaga University, April 2017

AMS Sectional Meeting, Washington State University, April 2017

PNW MAA Sectional Meeting, Gonzaga University, June 2017

MAA MathFest/Pi Mu Epsilon National Conference, Chicago, IL, July 2017

Nebraska Conference for Undergraduate Women in Mathematics, GU faculty advisor

February 2020, Sophie Kuhn (attended), Morgan McCurdy (attended), Michele Ortiz (attended)

January 2019, Stephanie Kolden (attended), Sydney Schmidt (poster presentation)

January 2018, Emma Kar (attended), Hannah Tolson (poster presentation)

February 2017, Rachael Kuhn (attended), Hayley Olson (poster presentation)

Undergraduate Research Projects Advised

August 2019-present, *Monitoring Power Networks*, co-advised with H. Whitlatch

Students: Lana Kniahnitskaya, Olivia Ramirez, Michele Ortiz

August 2016-April 2019, *Equidecomposability of Polygons*, co-advised with J. Lutz

Students: Maegan Chmielewski-Anders, Stephen Joyce, Trent DeGiovanni, Olivia Ramirez, Hannah Tolson

May-August 2018, *Algebraic Genetics*, student designed project co-advised with J. Lutz

Student: Hannah Tolson

Graduated Advisees

Trent DeGeovanni; University of Utah Ph.D. program in Mathematics

Advising Academy

August 2016-April 2017, participant

PROFESSIONAL SOCIETIES

American Mathematical Society

Association for Women in Mathematics

Mathematical Association of America