

ROBERT W. BELL

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Holmes Hall, Rm W-26C	Wells Hall, Rm C-305
Lyman Briggs College	Department of Mathematics
Michigan State University	Michigan State University

EMPLOYMENT HISTORY

Associate Professor, Lyman Briggs College and Department of Mathematics, Michigan State University, July 2012–present.

Visiting Scholar, University of Michigan, Department of Mathematics, August 2017–August 2018.

Assistant Professor, Lyman Briggs College and Department of Mathematics, Michigan State University, Aug. 2006–June 2012.

Assistant Professor (Lecturer), Department of Mathematics, University of Utah, Aug. 2003–May 2006.

EDUCATION

The Ohio State University, Ph.D. Mathematics, May 2003, Dissertation advisor: Ruth M. Charney.

Syracuse University, M.S. Mathematics, December 1996.

Boston College, A.B. Mathematics with honors, May 1995, Magna Cum Laude, Phi Beta Kappa.

AWARDS

NSF VIGRE Postdoctoral Fellow, University of Utah, Aug. 2003–May 2006.

All-University Graduate Fellow, Syracuse University, August 1995–May 1998.

PUBLICATIONS

Robert W. Bell and Rita Gitik. *Quasi-positivity and recognition of products of conjugacy classes in free groups*. Available at arXiv:1808.03291.

Taylor Ball, Robert W. Bell, Jonathan Guzman, Madeleine Hanson-Colvin, and Nikolas Schonsheck. *The cop number of generalized Petersen graphs*. Discrete Mathematics. Online: available November 2016. Print: Volume 340, Issue 6, June 2017, pp. 1381–1388.

Robert W. Bell and Matt Clay. “Right-angled Artin groups,” book chapter in *Office Hours with a Geometric Group Theorist*, M. Clay and D. Margalit, editors, Princeton University Press, 2017.

Bell, Robert W. & Zeleke, Aklilu. *Starting and Sustaining an Undergraduate Research Program: The SURIEM Experience at Michigan State University*, PRIMUS, DOI: 10.1080/10511970.2016.1240730. Published online: 10 October 2016.

Robert W. Bell. *Combinatorial Methods for Detecting Surface Subgroups in Right-Angled Artin Groups*. ISRN Algebra, vol. 2011, Article ID 102029, 6 pages, 2011. doi:10.5402/2011/102029.

Robert W. Bell and Dan Margalit. *Injections of Artin groups*. Commentarii Mathematici Helvetici, 82 (2007), no. 4, 725-751.

Robert W. Bell and Dan Margalit. *Braid groups and the co-Hopfian property*. Journal of Algebra, 303 (2006), no. 1, 275-294.

Robert W. Bell. *Three dimensional FC Artin groups are CAT(0)*. Geometriae Dedicata, 113 (2005), 21-53.

GRANTS

PI, “Summer Undergraduate Research Institute in Experimental Mathematics (SURIEM)”, National Security Agency, NSA Award No. H98230-21-1-0025, 5/1/2021–4/30/2022, amount awarded: \$77,164.

PI, “Summer Undergraduate Research Institute in Experimental Mathematics (SURIEM)”, National Security Agency, NSA Award No. H98230-20-1-0006, 5/1/2020–4/30/2021, amount awarded: \$103,214.

PI, “REU Site: REU in Discrete and Applied Mathematics”, NSF Division of Mathematical Sciences, NSF Award No. 1852066, 5/1/2019–4/30/2022, amount awarded: \$261,739.

PI, “Summer Undergraduate Research Institute in Experimental Mathematics (SURIEM)”, National Security Agency, NSA Award No. H98230-19-1-0014, 5/1/2019–4/30/2020, amount awarded: \$94,917.

PI, “Summer Undergraduate Research Institute in Experimental Mathematics (SURIEM)”, National Security Agency, NSA Award No. H98230-18-1-0042, 4/18/2018–4/17/2019, amount awarded: \$101,554.

PI, “REU Site: REU in Discrete and Applied Mathematics”, NSF Division of Mathematical Sciences, NSF Award No. 1559776, 4/1/2016–3/31/2019, amount awarded: \$287,199.

PI, “Summer Undergraduate Research Institute in Experimental

Mathematics (SURIEM)", National Security Agency, NSA Award No. H98230-16-1-0031, 5/16/2016–5/15/2017, amount awarded: \$85,109.

co-PI, "Summer Undergraduate Research Institute in Experimental Mathematics (SURIEM)", National Security Agency, PI: Aklilu Zeleke, NSA Award No. H98230-15-1-0047, 5/16/2015–5/15/2016, amount awarded: \$84,194.

Senior Personnel, "LEVERS: Leveraging Engagement and Vision to Encourage Retention in STEM", Howard Hughes Medical Institute, New Awards for Science Education to Research Universities, PI: R. Sekhar Chivukula, 5/16/2014–5/16/2019, amount awarded: \$1,500,000. Bell and Zeleke will develop an inquiry based calculus course for life sciences.

co-PI, "Summer Undergraduate Research Institute in Experimental Mathematics (SURIEM)", National Security Agency, PI: Aklilu Zeleke, NSA Award No. H98230-13-1-0259, 5/1/2013–4/30/2015, amounts awarded: \$94,045 in 2013; \$76,868 in 2014.

Senior Personnel, "Science Scholarship Program at Lyman Briggs College Phase 2", NSF award no. 1153778, NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM), PI: Ryan Sweeder, 5/1/2012–4/30/2016, amount awarded: \$599,834.

co-PI, "REU Site in Applied & Discrete Mathematics", NSF award no. 1062817, NSF Division of Mathematical Sciences, PI: Aklilu Zeleke, 9/1/2011–8/31/2014, amount awarded: \$275,406.

co-PI, "Summer Undergraduate Research Institute in Experimental Mathematics", NSA grant no. H98230-11-1-0222, National Security Agency, PI: Aklilu Zeleke, amount awarded: \$83,706 2011-12 in 2011 REU and \$83K in 2012.

co-PI, "REU Site in Probability and Discrete Mathematics", NSA award no. H98230-10-1-0222, National Security Agency, PI: Aklilu Zeleke, amount awarded: \$87,199 in 2010.

Senior Personnel, EMSW21-RTG: "Research Training in Geometry and Topology at Michigan State University", NSF award no. 0739208, NSF Division of Mathematical Sciences, PI: Ronald Fintushel, 2008-2012, amount awarded: \$640,000.

BOOK REVIEWS

Beyond Hyperbolicity by Mark Hagen, Richard Webb, and Henry Wilton, eds., Cambridge University Press, LMS Lecture Note Series, pp. 440,

ISBN: 9781108447294. Reviewer: Robert W. Bell. Published on MAA Reviews 8/23/2020.

MATHEMATICAL REVIEWS (MathSciNet)

MR4012570 McLeay, Alan. “Geometric normal subgroups in mapping class groups of punctured surfaces.” *New York J. Math.* 25 (2019), 839–888. (Reviewer: Robert W. Bell)

MR3897975 Durham, Matthew Gentry; Fanoni, Federica; Vlamis, Nicholas. Graphs of curves on infinite-type surfaces with mapping class group actions. *Ann. Inst. Fourier (Grenoble)* 68 (2019), no. 6, 2581–2612. (Reviewer: Robert W. Bell)

MR3822286 Farley, Daniel S.; Hughes, Bruce, Braided diagram groups and local similarity groups. *Geometric and cohomological group theory*, 15–33, *London Math. Soc. Lecture Note Ser.*, 444, Cambridge Univ. Press, Cambridge, 2018. (Reviewer: Robert W. Bell)

MR3723556 Amram, Meirav; Shwartz, Robert; Teicher, Mina. Covers of D-type Artin groups. *Electron. J. Combin.* 24 (2017), no. 4, Paper 4.17, 26 pp. (Reviewer: Robert W. Bell)

MR3639631 Reviewed Calvez, Matthieu; Wiest, Bert Curve graphs and Garside groups. *Geom. Dedicata* 188 (2017), 195–213. (Reviewer: Robert W. Bell)

MR3513110 Terragni, Tommaso. On the growth of a Coxeter group. *Groups Geom. Dyn.* 10 (2016), no. 2, 601–618. (Reviewer: Robert W. Bell)

MR3434544 Fedoseev, Denis A.; Manturov, Vassily O.; Cheng, Zhiyun. On marked braid groups. *J. Knot Theory Ramifications* 24 (2015), no. 13, 1541005, 12 pp. (Reviewer: Robert W. Bell)

MR3314944 Kar, Aditi; Nikolov, Nikolay Rank gradient and cost of Artin groups and their relatives. *Groups Geom. Dyn.* 8 (2014), no. 4, 1195–1205. (Reviewer: Robert W. Bell)

MR3252966 Guilbault, Craig R.; Mooney, Christopher P. Boundaries of Croke–Kleiner-admissible groups and equivariant cell-like equivalence. *J. Topol.* 7 (2014), no. 3, 849–868. (Reviewer: Robert W. Bell)

MR3114776 Polák, Jason K. C.; Wise, Daniel T. Polygonal VH complexes. *Publ. Mat.* 57 (2013), no. 2, 421–428. (Reviewer: Robert W. Bell)

MR2914860 Clay, Matt T.; Leininger, Christopher J.; Mangahas, Johanna. The geometry of right-angled Artin subgroups of mapping class groups.

- Groups Geom. Dyn. 6 (2012), no. 2, 249–278. (Reviewer: Robert W. Bell)
- MR2918313 Hosaka, Tetsuya. On boundaries of Coxeter groups and topological fractal structures. Tsukuba J. Math. 35 (2011), no. 2, 153–160. (Reviewer: Robert W. Bell)
- MR2846406 Digne, François; Marin, Ivan; Michel, Jean. The center of pure complex braid groups. J. Algebra 347 (2011), 206–213. (Reviewer: Robert W. Bell)
- MR2802164 Peyrerimhoff, Norbert; Vdovina, Alina. Cayley graph expanders and groups of finite width. J. Pure Appl. Algebra 215 (2011), no. 11, 2780–2788. (Reviewer: Robert W. Bell)
- MR2776985 McCammond, Jon; Wise, Daniel. Windmills and extreme 2-cells. Illinois J. Math. 54 (2010), no. 1, 69–87. (Reviewer: Robert W. Bell)
- MR2734148 An, Byung Hee; Ko, Ki Hyoung. *A family of representations of braid groups on surfaces*. Pacific J. Math. 247 (2010), no. 2, 257–282. (Reviewer: Robert W. Bell)
- MR2669638 Gordon, Cameron; Wilton, Henry. *On surface subgroups of doubles of free groups*. J. Lond. Math. Soc. (2) 82 (2010), no. 1, 17–31. (Reviewer: Robert W. Bell)
- MR2644310 Lee, Eon-Kyung; Lee, Sang-Jin. *Uniqueness of roots up to conjugacy for some affine and finite type Artin groups*. Math. Z. 265 (2010), no. 3, 571–587. (Reviewer: Robert W. Bell)
- MR2552249 Bestvina, Mladen; Bux, Kai-Uwe; Margalit, Dan. *The dimension of the Torelli group*. J. Amer. Math. Soc. 23 (2010), no. 1, 61–105. (Reviewer: Robert W. Bell)
- MR2599567 Mj, Mahan. *Mapping class groups and interpolating complexes: rank*. J. Ramanujan Math. Soc. 24 (2009), no. 4, 341–357. (Reviewer: Robert W. Bell)
- MR2556030 Andersen, Jørgen Ellegaard; Bene, Alex James; Penner, R. C. *Groupoid extensions of mapping class representations for bordered surfaces*. Topology Appl. 156 (2009), no. 17, 2713–2725. (Reviewer: Robert W. Bell)
- MR2497785 Fujiwara, Koji. *Quasi-homomorphisms on mapping class groups*. Handbook of Teichmüller theory. Vol. II, 241–269, IRMA Lect. Math. Theor. Phys., 13, Eur. Math. Soc., Zürich, 2009. (Reviewer: Robert W. Bell)

MR2493376 Vershinin, V. V. *On the inverse braid monoid*. *Topology Appl.* 156 (2009), no. 6, 1153–1166. (Reviewer: Robert W. Bell)

MR2457429 Hosaka, Tetsuya. *Minimality of the boundary of a right-angled Coxeter system*. *Proc. Amer. Math. Soc.* 137 (2009), no. 3, 899–910. (Reviewer: Robert W. Bell)

MR2422070 Crisp, John; Sageev, Michah; Sapir, Mark. *Surface subgroups of right-angled Artin groups*. *Internat. J. Algebra Comput.* 18 (2008), no. 3, 443–491. (Reviewer: Robert W. Bell)

MR2392822 Tillmann, Ulrike. *Artin's map in stable homology*. *Bull. Lond. Math. Soc.* 39 (2007), no. 6, 989–992. (Reviewer: Robert W. Bell)

MR2386796 Funar, Louis. *Braided Houghton groups as mapping class groups*. *An. Ştiinţ. Univ. Al. I. Cuza Iaşi. Mat. (N.S.)* 53 (2007), no. 2, 229–240. (Reviewer: Robert W. Bell)

MR2336251 Wang, Stephen. *Representations of surface groups and right-angled Artin groups in higher rank*. *Algebr. Geom. Topol.* 7 (2007), 1099–1117. (Reviewer: Robert W. Bell)

MR2313068 Geoghegan, Ross; Ontaneda, Pedro. *Boundaries of cocompact proper CAT(0) spaces*. *Topology* 46 (2007), no. 2, 129–137. (Reviewer: Robert W. Bell)

MR2263057 Caprace, Pierre-Emmanuel. *Conjugacy of 2-spherical subgroups of Coxeter groups and parallel walls*. *Algebr. Geom. Topol.* 6 (2006), 1987–2029. (Reviewer: Robert W. Bell)

MR2252676 Antony, Noelle. *The natural embedding of positive singular Artin monoids*. *Comm. Algebra* 34 (2006), no. 9, 3329–3346. (Reviewer: Robert W. Bell)

MR2241974 Lafont, Jean-Francois. *Strong Jordan separation and applications to rigidity*. *J. London Math. Soc. (2)* 73 (2006), no. 3, 681–700. (Reviewer: Robert W. Bell)

MR2197811 Chatterji, Indira; Niblo, Graham. *From wall spaces to CAT(0) cube complexes*. *Internat. J. Algebra Comput.* 15 (2005), no. 5-6, 875–885. (Reviewer: Robert W. Bell)

MR2183979 Antony, Noelle. *On singular Artin monoids and contributions to Birman's conjecture*. *Comm. Algebra* 33 (2005), no. 11, 4043–4056. (Reviewer: Robert W. Bell)

PROFESSIONAL ACTIVITIES

Co-organizer (with Zeleke) of the Summer Research Institute in

Experimental Mathematics (SURIEM), a summer REU program in mathematics at MSU (Summer 2010-present). Served as director 2015–present.

Co-organizer (with Yunus Zeytuncu) of the Summer Undergraduate Michigan Mathematics Research (SUMMR) Conference (online, 2020, 2021).

Co-organizer (with Zeleke) of the Summer Undergraduate Michigan Mathematics Research (SUMMR) Conference (2012, 2015).

Organizer of the Summer Undergraduate Michigan Mathematics Research (SUMMR) Conference (2018).

Co-organizer (with Zeleke) of the Summer Undergraduate Michigan Mathematics Research (SUMMR) Conference (2012, 2015).

Developer and consultant for Expacon - a mathematical game based on group theory by Gilbert Baumslag

Advisor for MSU's COMAP Mathematics Contest in Modeling team (2008, 2009, 2013, 2014, 2020)

Co-organizer of an MSU undergraduate trip to MathFest, Madison, WI (Summer 2008)

Co-organizer (with Zeleke) of the Michigan Undergraduate Math Conference (2007)

Co-organizer (with Charney) of an NSF VIGRE working group on geometric group theory at Ohio State (2002)

Referee for *Geometry & Topology*, *Journal of Pure & Applied Algebra*, *Michigan Math Journal*, *Astérisque*, *The American Mathematical Monthly*, *The Electronic Journal of Combinatorics*, *Journal of Algebra*, *American Journal of Mathematics*, *International Mathematics Research Notices*, *Australasian Journal of Combinatorics*, *Art of Discrete and Applied Mathematics*, and various conference proceedings.

External reviewer for RPT (2019)

NSF Panelist (2019)

PROFESSIONAL MEMBERSHIPS

American Mathematical Society
Mathematical Association of America

PROGRAMMING EXPERIENCE

C, CSS, HTML, Mathematica, Matlab, Python, R, SageMath, WebAssign,

WeBWork

TEACHING

Michigan State University:

MTH 103 College Algebra (FS12–14, FS18–19)
LB 117 Functions & Trigonometry (FS20)
LB 118 Calculus I (FS06–08, FS11, FS14–15, FS21, SS07)
LB 118 Calculus I, Special Section for Life Science Majors (SS16, SS17)
LB 119 Calculus II (FS09–10, FS12, FS20–21)
UGS 200H Honors Research Seminar: Experimental Mathematics
(FS07–SS08, FS19–SS20, FS20–SS21, FS21–SS22)
LB 220 Calculus III (FS13, FS15, SS08, SS11–13, SS17, SS20–21)
MTH 254H Honors Multi-variable Calculus (SS12)
MTH 291 Mathematical Snapshots (SS15)
MTH 299 Transitions (SS14)
MTH 309 Linear Algebra (FS06)
MTH 310 Abstract Algebra & Number Theory I (SS11)
MTH 419H Honors Algebra II (SS15–16)
MTH 432 Axiomatic Geometry (SS21–22)
MTH 482 Discrete Mathematics II (SS20)
LB 492 Senior Seminar: Modern Mathematical Discoveries (FS11)
LB 492 Senior Seminar: The Mathematics of Politics (SS09)
LB 492 Senior Seminar: Artificial Intelligence, Big Data, and Machine
Learning (SS19)
MTH 496 Capstone in Mathematics: Geometric Group Theory (SS19)
MTH 996 Geometric Group Theory (SS09, SS13)

University of Utah:

Introduction to Analysis II (SS06)
Intermediate Algebra (FS05)
Algebraic Topology (SS05)
Point Set Topology (FS04)
Introduction to Algebraic Topology (SS04)
Introduction to Analysis (FS03)

The Ohio State University:

Various calculus and pre-calculus courses (FS98–SS03)

Syracuse University:

Calculus, pre-calculus, and business calculus courses (SU96–SS98)

ADDITIONAL TEACHING

Reading course: Mapping class groups (SS17, SS20)
 Reading course: Symmetry & Permutation Groups (FS16)
 Reading course: Networks and Graph Theory (SU15)
 Reading course: Mathematical Biology (SS15)
 Reading course: Combinatorics of Coxeter Group (SU14)
 Reading course: Mapping class groups (SS14)
 Reading course: Thompson's group and the Lamplighter group (SU13)
 Reading course: Pursuit and evasion games on graphs (SS13)
 Reading course: Geometric group theory (SU12)
 Reading course: Simplicial complexes and algebraic topology (SU12)
 Reading course: Knot theory (SU09)
 Reading course: Calculus on manifolds (SS09)
 Putnam team: (FS08)
 Reading course: Abstract algebra II (Utah, SS05)
 Reading course: Calculus on manifolds (Utah, SU04)
 High School Math Circles lecturer (Utah, FS03–SS05)

COURSE DEVELOPMENT

Honors Seminar: Experimental Mathematics (FS19–SS20): This is a reboot of a course by the same name from FS07. Eight 1st or 2nd year students in MSU's Honors College worked in teams of 2–3 students on projects in mathematics and computation. Topics: introduction to programming, dynamical systems, recursive polynomials, networks and graphs. The Python programming language and SageMath computer algebra engine were used for these projects. In the spring semester, each team is focusing on different specialized topic; these are as follows: postman tours on graphs, Lucas polynomials and Lucas atoms, chip firing and sandpiles. The course emphasizes computer programming, mathematical reasoning, and research on accessible topics.

Senior Seminar: Artificial Intelligence, Big Data, and Machine Learning (SS19). This was a course for seniors (typically non-mathematics majors) in LBC. The course introduced several ideas from mathematics and theoretical computer science, e.g. algorithms, automata and Turing machines, neural networks, procedural programming. The focus, however, was on ethical and societal questions. Readings included media articles on advances in AI, e.g. the AlphaZero program which learns how to play Go and beats the best human players, and research books written by experts in diverse fields (Cathy O'Neil, data scientist; Virginia Eubanks, sociologist; Nick Bostrom, philosopher; Safiya Noble, sociologist; Virginia Eubanks, sociologist). Students worked on term projects that culminated in

presentations and final reports.

Capstone in Mathematics: Geometric Group Theory (SS19). This is a course for senior mathematics majors, many of whom have not yet studied groups. The course emphasizes groups as transformations. Many examples of infinite groups are introduced (free groups, $SL(2, \mathbb{Z})$, reflection groups, Lamplighter group, Thompson's group, Baumslag-Solitar groups). Finitely generated groups are studied as metric spaces (via their Cayley graph or via isometric actions on other metric spaces). Ideas from linear algebra, analysis, and topology are used, introduced just in time as needed. Students work on term projects and give final presentations.

Precalculus to Calculus (SU17): Joint work with Abe Edwards on developing curriculum and learning objectives for LB 117, a precalculus course with a tighter focus on themes and topics necessary for success in LB 118 Calculus I. We pitch this as the first part of Calculus I.

Calculus for Life Science Majors (FS15–SS18): This is work in progress, joint with Zeleke, and is part of a larger effort to transform undergraduate STEM education. The effort is funded by a grant from the HHMI. The course will use real data, modeling, and inquiry methods.

Senior Seminar: Modern Mathematical Discoveries (SS11): The aim of this course was for non-mathematics majors in Lyman Briggs College, especially those who might go into science policy, to learn about some of the great mathematical achievements of the 20th century in much the same way that one with a limited scientific background could learn about 20th century physics. Students were expected to present mathematical topics in written, oral, and audio-visual formats to their peers.

Senior Seminar: The Mathematics of Politics (SS09): This was a course for senior non-math majors in Lyman Briggs College. This course emphasized problem solving, mathematical reasoning, and scientific writing. Topics included game theory, models of escalation, fair division, and voting theory.

Honors Seminar: Experimental Mathematics (FS07–SS08): This was a course for first year students in the MSU Honors College developed jointly with Akililu Zeleke. The course emphasized computer programming, designing computer simulations, and undergraduate research. Topics included probability, dynamical systems, and discrete mathematics.

UNDERGRADUATE RESEARCH MENTORING

UGS 200H students (9 in all). Projects: mathematics of games (shi doku, lights out, combinatorial painting) SS22.

Cassidy George (University of San Francisco), Kelsey Knobloch (Central Michigan University), Emmerson McMullen (Harvey Mudd College), and Zachary Stewart (MSU). SURIAM REU students in 2021. Research topics: the game of cops and robbers on graphs.

UGS 200H students (6 in all). Projects: the game of Shikaku and chessboard tiling problems. SS21.

UGS 200H students (8 in all). Projects: sandpiles, Lucas polynomials, and the Chinese postman problem. SS20.

Jadyn Morris (MSU). Research topics: scientific computing, discrete mathematics. Summer 2020.

Jonathan Martinez (Bakersfield Community College), Olu Olorode (Mercer County Community College), Abby Priewisch (Franciscan University of Steubenville), Nicki Schneider (Wartburg College). SURIAM REU students in 2019. Research topics: the game of cops and robbers on graphs.

Tao Fei, Jonathan Fleck (MSU), Spencer Lee (MSU), Chris Wilcox (MSU). Undergraduate research students. Research topics: pursuit and evasion games on graphs. SS17.

Julie Bowman (Southwestern Baptist University), Arhtur Diep-Nguyen (Boston College), Rashmika Goswami (University of Michigan), Dylan King (University of Nebraska at Omaha), Nicholas Lindell (University of Georgia). Summer REU students. Research topics: weak cop numbers of planar tilings, the game of seepage. Summer 2016.

Levi Crews (Duke University), Garrette Divens (Morehouse College), Jordan DuBeau (Middlebury College), Beth Matys (Gettysburg College), Gregory Rodriguez (NYU), Will Vosjepka (USAF Academy). Summer REU students. Research topics: Weak cop numbers of infinite graphs, cop numbers of amalgams of graphs. Summer 2015.

Taylor Ball (Indiana University), Jonathan Guzman (California State College, Long Beach), Madeleine Hanson-Colvin (Bryn Mawr College), and Nikolas Schonsheck (Vassar College). Summer REU students. Research topic: Bounds on the cop number of generalized Petersen graphs and the cop number of grids on surfaces. Summer 2014.

Adam Sarchili and David Wegscheid, reading course. Research topic: Generalizations of active and passive cop numbers of finite graphs. SS13.

Alex Ethridge (MSU). Research topic: Connolly surfaces and computer modeling of molecules. SS13.

Thomas Bolden (MS), LB 119 and LB220 student. Research topic: Knot theory. FS12–SS13.

Kirstyn Baker (Alma College), Caitlin Graff (Idaho State), Aashish Srinivas (Swarthmore), Anthony Graves-McCleary (Vassar), and Phil Thomas (Indiana). Summer REU students. Research Topics: pursuit and evasion games on graphs. Summer 2012.

John Hopfensberger (MSU), Professorial Assistant. Research topic: group theory FS10–SS11.

Adam Sarchilli (MSU), Professorial Assistant. Research topic: combinatorial games. FS10–SS11.

Erica Dominic (Kalamazoo College), Rebecca Meyer (Whitworth College), Ramond Perkins (Morehouse College), Garrett Rodriguez (Alma College), and Joshua Ritter (MSU). Summer REU students. Research Topics: pursuit and evasion games on graphs. Summer 2010.

Rachel Klavon (MSU), Professorial Assistant. Research topic: combinatorial games and computer programming. FS07–SS09.

Kathleen Bonnen (MSU), Professorial Assistant. Research topic: combinatorial games and group theory. FS07–FS08.

Jeremy Pecharich (Utah), NSF VIGRE REU student. Research topic: hyperbolic geometry and non-positive curvature. Summer 2004–Summer 2005.

HONORS OPTION PROJECTS SUPERVISED

Amanda Molix. Topic: Pic arête, dots and boxes, and strings and coins, SS20.

Sydney Miller. Topic: The mathematics of Tchoukaillon, a solitaire variant of Mancala, FS14.

Jonathan Boss. Topic: Schwartz’s example of a sequence of polygonal surfaces which geometrically approximate a finite cylinder, but whose areas diverge, FS13.

Michael Cross. Topic: Deriving Snell’s Law and the AM/GM inequality using Lagrange Multipliers, FS13.

Michael Sterner. Topic: A mathematical derivation of Kepler’s Laws, SS13.

Scott O’Connor. Topic: Regular tournaments, SS11.

Craig Pearson. Topic: Cesàro sums, SS11.

Sara Dykowski & Robert McGowan. Topic: RSA cryptography, FS10.

Santosh Gunturu. Topic: programming and card counting, FS10.

Andrew Johnson. Topic: least squares approximations, FS10,

Eric Lee. Topic: programming and the game of nim, FS10.

Craig Pearson. Topic: Fourier series, FS10.

Paul Ryan. Topic: programming and games, FS10.

Kevin Steelman. Topic: mathematics of a tennis serve, FS10.

Megan Climans. Topic: programing and numerical methods, FS08.

Nelson Winkler. Topic: the fifteen puzzle, FS07.

Valerie Rygiel. Topic: chessboard problems, FS07.

Michael Moran. Topic: programing and games, FS07.

Teresa Deluca. Topic : logic and proof, FS06.

GRADUATE STUDENT MENTORING

Rob McConkey, SS20. Reading course on mapping class groups.

Michael Shultz, SS17. Reading course on mapping class groups.

Emad Zahedi, Summer 2015. Reading course on networks and graph theory.

Emily Olson, Summer 2014. Reading course on combinatorics of Coxeter groups.

Stephen Burton and Deborah Franks, Spring 2014. Reading course on mapping class groups.

Deborah Franks, Summer 2013. Reading course in geometric group theory.

Joshua Hallam, Summer 2012. Reading course in algebraic topology.

Christine Lee, Summer 2012. Reading course in hyperbolic geometry and geometric group theory.

Jeremy Walthers, Summer 2010. Reading course in geometric group theory.

GRADUATE COMPREHENSIVE EXAM COMMITTEE

Rob McConkey, MSU 2020

Quinn Minnich, MSU 2020

Rachel Domagowski, MSU 2020

Joseph Melby, MSU 2019

Michael Shultz, MSU 2017

Duff Baker-Jarvis, MSU 2016

Eylem Yildiz, MSU 2016

Metin Ozsarfati, MSU 2016
Emad Zahedi, MSU, 2015
Emily Olson, MSU, 2015
Stephan Burton, MSU, 2014
Samantha Dalhberg, MSU, 2013
Joshua Hallam, MSU, 2013
Christine Lee, MSU, 2012
Kenny Barrese, MSU 2012
Joshua Thompson, Utah, 2006
Scott Crofts, Utah, 2006

DISSERTATION COMMITTEE

Michael Shultz, MSU 2021
Rachel Domalgowski, MSU 2021
Brandon Bavier, MSU 2021
Sanjay Kumar, MSU 2021
Eylem Yildiz, MSU 2019
Duff Baker-Jarvis, MSU 2019
Emad Zahedi, MSU 2017
Samuel Lin, MSU 2017
Stephan Burton, MSU 2017
Emily Olson, MSU 2017
Samantha Dalhberg, MSU 2016
Joshua Hallam, MSU 2015
Kenny Barrese, MSU 2015
Christine Lee, MSU 2015
Luke Williams, MSU 2015
Faramarz Vafaei, MSU, 2014
Adam Giambrone, MSU, 2014
Christopher Hays, MSU, 2013
Cheryl Balm, MSU, 2013

PROFESSIONAL DEVELOPMENT WORKSHOPS ATTENDED

STEM Teaching Essentials Workshop: Equitable Grading: Case studies and examples from the community, November 10, 2021

STEM Teaching Essentials Workshop: More than a square: Students add dimension to their digital learning experiences during the pandemic, February 23, 2021

Mathematics Department Online Learning Workshop, August 2020.

STEM Teaching Essentials Workshop: Normalizing Struggle: Supporting Students through Academic Challenges In and Out of the Classroom, October 9, 2019

STEM Teaching Essentials Workshop: Strategies to Promote Effective Student Teams, September 11, 2019

STEM Teaching Essentials Workshop: Exams as Learning Opportunities: Using Assessment Corrections to Enhance Meaningful Learning and Reflection, October 9, 2018.

STEM Gateway Conference, workshop and conference related to work on the HHMI LEVERS grant, each May (2015–2018).

Inclusion in Math and Advising Learning Community workshop sponsored by the Department of Mathematics and the Office for Inclusion and Intracultural Initiatives, MSU, May 3, 2018.

Panelist for the Professional Development Workshop on Undergraduate Research on April 24, 2018, sponsored by the Department of Mathematics at MSU.

Facilitating Entering Research Workshop, sponsored by the National Mentoring Research Network at the University of Wisconsin at Madison, March 22–23, 2018.

STEM Teaching Essentials Workshop: How Undergraduate Research Impact Faculty, MSU Spring 2017

MSRI Workshop on Geometry of mapping class groups and $Out(F_n)$, October 2016

AIM Workshop on Boundaries of Groups, October 2016

MSRI Workshop on Groups acting on $CAT(0)$ spaces, September 2016

HHMI LEVERS Gateway Summit, MSU 2015–17

STEM Teaching Essentials Workshop: The Role of Faculty in Increasing Student Success, Spring 2016

STEM Alliance Meetings, MSU, 2013–present

Problem Based Learning Brown Bag, Jon Sticklen and Claudia Vergara, MSU, Spring 2013

MSRI Hot Topics Workshop on Surface subgroups and cube complexes, March 2013

CREATE Calculus at MSU: Improving student outcomes, David Bressoud MSU, Summer 2012

Lily Seminar Series: Moving from Effective Teaching to the Scholarship of Teaching and Learning, Karl Smith, MSU, Fall 2009

Lily Seminar Series: Design and Implementation of Active and Cooperative Learning, Karl Smith, MSU, Fall 2009

Lily Seminar Series: Opening the Classroom Door: Focus on Teaching Large Classes, Mary Bremigan, Diane Ebert-May, Carl Liedholm, and Kami Silk, MSU, Spring 2008

Spring Institute on College Teaching and Learning: Design and Implementation of Active and Cooperative Learning in Large Classes, Karl Smith, MSU, Spring 2008

Workshop Participant, AIM Workshop on Braid Groups, Clusters, and Free Probability, January 2005.

COMMITTEE WORK

LBC/PRIME TS Asst. Prof. Search Committee (chair), AY21-22.

Ad hoc LBC Bylaws Review Committee, Spring 21–present.

University Committee on Academic Governance, LBC representative, Fall 2020–present, vice-chair 2021–22.

University Hearing Board, LBC representative, Fall 2020–present.

LBC Educational Policy Committee, math representative, Fall 2020–present, chair 2021–22.

Faculty Senate, Lyman Briggs College representative, Fall 2019–Summer 2020.

Briggs Advisory Council, Lyman Briggs College, Fall 2018–Summer 2020. Chair 2019-20.

University Committee on Libraries, CNS representative, Fall 2018–Summer 2020.

Lyman Briggs College Speaker Series, Spring 2011– Summer 2018.

MSU IDEA Coordinator, Spring 2008–2017. This university level committee advises the Office of the Provost on issues of diversity and inclusion.

Math and Physics Academic Specialist Search Committee, 2015.

HPS of Computer Science Tenure Stream Search Committee, 2015.

Undergraduate Studies Committee, Mathematics Department, Fall 2013–Spring 2015.

Lyman Briggs College Awards Committee, Fall 2011–2013, chair 12-13.
SALG (Student Assessment of Learning Gains) committee, 2008–2010.
The charge of this ad-hoc LBC committee is to reform and study the use of student evaluations.

LBC Bylaws committee, 2009–2010. This ad-hoc LBC committee was charged with revising the bylaws of the college.

LBC metrics committee, 2008. This ad-hoc LBC committee was charged with determining metrics by which the college would like to be measured over the next 5-10 years.

UGLA committee, 2008. This ad-hoc LBC committee was charged with studying ways to better utilize our undergraduate learning assistants.

OUTREACH

Grandparents' University. Course offering: The mathematics of counting, puzzles, and shapes. I recruited some of the students in the SURIEM Summer REU Program to co-present and assist. Summer 2012, 2014–17.

Girl's Math / Science Day discovery presenter (with Cheryl Balm (2010), Kathleen Bonnen (2008, 2009), Rachel Klavon (2008), and Victoria McCoy (2007)), East Lansing High School.

Reviewer of grade 3-5 math / science assessment tests for the MST Education Department at MSU, Fall 2007.

OTHER SERVICE

MSU chapter Phi Beta Kappa, Vice President (2009-2013), President (2013-present).

Reviewer for the MLK Advancing Inclusion Through Research Award, 2012–2016, 2019

Author of mathematics problems for the Alumni Distinguished Scholarship Exam for prospective MSU students, 2015.

Organizer, MSU Math Student Conference team problem solving contest, 2012–2015.

Dealer, Casino Night in Holmes Hall, 2012–2015.

Binder Park Zoo S-STEM scholarship student field trip participant and driver, Fall 2012.

Panelist, High School Honors Science Program, Summer 2011.

Co-organizer, MLK Day LBC events, 2010–2012.

Panelist, Lyman Briggs Book Debate, SS08, SS09, FS09.

INVITED TALKS, SEMINAR TALKS, COLLOQUIA

Braids, permutations, and complexity. MSU Math Club, Fall 2020.

Cops and Robbers and the SURIEP REU Program, AMS Contributed Paper Session on Combinatorics and Graph Theory, Joint Mathematics Meetings, Denver, CO, Spring 2020.

Cop number and edge deletion, addition, or subdivision, Combinatorics and Graph Theory Seminar, MSU, Fall 2019.

Variations of cops and robbers on infinite graphs, Combinatorics and Graph Theory Seminar, MSU, Fall 2019.

Quasi-positivity in free groups and braid groups, Geometry and Topology Seminar, MSU, Spring 2019.

Quasi-positivity and recognition of products of conjugacy classes in free groups, Session for Contributed Papers, Fall Southeastern Sectional Meeting of the AMS, Fall 2018.

Weak cop number of infinite graphs, Kalamazoo College Mathematics Colloquium, Fall 2018.

Finding play in your work (and work in your play), presentation to the first year students in the INQUIRE program in LBC, Fall 2018.

Weak cop number of infinite graphs, AMS Contributed Paper Session on Graphs and Their Applications, Joint Mathematics Meetings, San Diego, CA, Spring 2018.

Weak cop number of infinite graphs, Alma College Mathematics Colloquium, Fall 2017.

Mathematics courses in Lyman Briggs College and reform efforts (joint with Abe Edwards), Conversations Among Colleagues seminar, MSU, Spring 2017.

An exploration of right-angled Artin groups, MAA Special Session on Office Hours with a Geometric Group Theorist, Joint Mathematics Meetings, Atlanta, GA, Spring 2017.

Divergence of $CAT(0)$ groups, Geometry and Topology Seminar, MSU, Fall 2016.

Hyperbolic geometry, groups, and tilings, TOP-SUM (Topical Seminar in Undergraduate Mathematics) colloquium, MSU, Fall 2016.

Calculus Reform in LB 118, STEM Alliance Meeting presentation, MSU, Spring 2016.

Order polynomials and reciprocity (2 lectures), Combinatorics and Graph

Theory Seminar, MSU, Spring 2016.

Rank gradient and expanders (2 lectures), Group Theory Seminar, MSU, Fall 2015.

The weak cop number of an infinite graph, Colloquium, Albion College, Fall 2015.

The weak cop number of an infinite graph (2 lectures), Combinatorics and Graph Theory Seminar, MSU, Fall 2015.

The cop number of generalized Petersen graphs, AMS Sectional Meeting at Dalhousie University, Halifax, NS, Canada (October 2014); co-presenter: Madeleine Hanson-Colvin.

The cop number of generalized Petersen graphs (2 lectures), Combinatorics and Graph Theory Seminar, MSU, Fall 2014.

Roots of the characteristic polynomial of a hyperplane arrangement. Combinatorics and Graph Theory Seminar, MSU, Spring 2012.

Surface subgroups and embeddings between graph groups (4 lectures). Group Theory Seminar, MSU, Fall 2011.

On hyperbolic surface subgroups in right-angled Artin groups. AMS Sectional Meeting at the University of Utah, Fall 2011.

Pursuit and evasion games on graphs. Undergraduate Mathematics Colloquium, Central Michigan University, Spring 2011.

Combinatorial methods for detecting surface subgroups in right-angled Artin groups. AMS Sectional Meeting at Georgia Southern University, Spring 2011.

Pursuit and evasion games on graphs. Mathematics Colloquium, Albion College, Spring 2011.

Subgroups of graph groups (4 lectures). Group Theory Seminar, MSU, Fall 2010.

Surface Subgroups of right-angled Artin groups. Topology Seminar, Ohio State University, Spring 2010.

Surface subgroups of right-angled Artin groups. NY Group Theory Seminar, CUNY Graduate Center, Spring 2010.

Hamming codes. Mathematics Colloquium, Kalamazoo College, Spring 2010.

Surface subgroups (2 lectures). Topology Seminar, MSU, Spring 2010.

Logarithmic scales. Guest lecture, LB 155 Intro to Quantitative Science &

Research, MSU, Fall 2009.

What is geometric group theory? Pi Mu Epsilon Math Club, MSU, Spring 2009.

Davis manifolds and boundaries of CAT(0) groups. 3 & 4 Manifolds Seminar, MSU, Fall 2008.

Hamming codes, MSU summer program for under represented students, 2008.

The geometry of the word and conjugacy problems for finitely presented groups (3 lectures). Group Theory Seminar, MSU, Fall 2007.

What is the Poincaré conjecture? Pi Mu Epsilon Math Club, MSU, Spring 2007.

Groups, geometry, and algorithms. Freshman Math Seminar, MSU, Spring 2007.

Automorphisms of the pure braid group. AMS Sectional Meeting, Miami University, Spring 2007.

A combinatorial Gauss-Bonnet theorem. Mathematics Colloquium, Albion College, Spring 2007.

Spaces with non-positive immersions. Joint AMS-MAA Meetings, New Orleans, Spring 2007.

Spaces with non-positive immersions. AMS Sectional Meeting, University of Utah, Fall 2006.

Injective endomorphisms of Artin groups. Topology Seminar, MSU, Fall 2006.

Recent advances in the study of Artin groups. Mathematics Colloquium, MSU, Spring 2006.

Recent advances in the study of Artin groups. Mathematics Colloquium, Canisius College, Spring 2006.

Quasi-isometries, Alice's diary, and the Morse-Thue sequence. Max Dehn Seminar, University of Utah, Fall 2005.

Topological classification of regular closed curves in the Plane. Undergraduate Colloquium, University of Utah, Fall 2005.

Injections of Artin groups. AMS Sectional Meeting, UC Santa Barbara, Spring 2005.

Injections of Artin groups. Spring Topology and Dynamics Conference, Berry College, Spring 2005.

Injections of Artin groups. Max Dehn Seminar, University of Utah, Fall 2004.

Combinatorial Gauss-Bonnet theorems. Undergraduate Colloquium, University of Utah, Fall 2004.

Geometric injections of braid groups. Albany Group Theory Conference, Fall 2004,

Algorithms and undecidability. Graduate Student Seminar, University of Utah, Fall 2004.

Hyperbolic groups and $CAT(0)$ spaces. VIGRE mini-course on “The synthetic geometry of the Weil-Petersson metric”, University of Utah, Spring 2004.

Braid groups are almost co-Hopfian I. Max Dehn Seminar, University of Utah, Spring 2004.

Curvature testing in Artin groups. Albany Group Theory Conference, Fall 2003.

The geometry of Coxeter groups. Graduate Student Seminar, University of Utah, Fall 2003.

Three dimensional FC Artin Groups are $CAT(0)$. Max Dehn Seminar, University of Utah, Fall 2003.

Three dimensional FC Artin Groups are $CAT(0)$. AMS Sectional Meeting, Northeastern University, Fall 2002.