

CURRICULUM VITAE
Lucas Sabalka

PERSONAL

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EDUCATION

Doctor of Philosophy: **Mathematics**
University of Illinois at Urbana-Champaign, **May 2006**
Dissertation: [Braid groups on graphs](#)
Advisor: Ilya Kapovich

Bachelor of Science: **Mathematics, Computer Science, History; minors in Physics, Psychology**
With Honors, With Highest Distinction
University of Nebraska-Lincoln, **August 2002**
Thesis: [Geodesics in the braid group on three strands](#)
Advisors: Susan Hermiller and John Meakin

POSITIONS

Aug 2012-present: **Assistant Professor**
Saint Louis University

Jan 2009-May 2012: **Riley Assistant Professor**
Binghamton University

Aug 2006-Dec 2008: **Krener Assistant Professor**
University of California, Davis

INTERESTS

Geometric and combinatorial group theory, low-dimensional topology, combinatorics, geometry, applications of topology; more specifically: free groups, $Out(F_n)$, graph braid groups, braid groups and Artin groups, boundaries of spaces, configuration spaces, robot motion, persistent homology. Also: solar cell design and manufacture, computer vision (3-D object tracking and point cloud reconstruction).

PUBLICATIONS

(Publications available online: see [webpage](#), the [ArXiv](#), or use [hyperlinks to journals below](#))

- (11) **On restricting subsets of bases in relatively free groups**, with Dmytro Savchuk
International Journal of Algebra and Computation, 22(4):1250030, 2012
- (10) **On the geometry of a proposed curve complex analogue for $Out(F_n)$** , with Dmytro Savchuk
To appear, *Groups, Geometry, and Dynamics*.
- (9) **Face vectors of subdivided simplicial complexes**, with Emanuele Delucchi and Aaron Pixton
Discrete Mathematics, 312(2):248-257, 2012.
- (8) **Projection-forcing multisets of weight changes**, with Joshua Brown Kramer
Journal of Combinatorial Theory, Series A, 117(8):1136-1142, 2010
- (7) **Multidimensional online motion planning for a spherical robot**, with Joshua Brown Kramer
International Journal of Computational Geometry and Applications, 20(6):653-684, 2010
- (6) **Presentations of graph braid groups**, with Daniel Farley
Published online, *Forum Mathematicum* (2010). To appear in print.
- (5) **On rigidity and the isomorphism problem for tree braid groups**
Groups, Geometry, and Dynamics, 3(3):469-523, 2009
- (4) **On the cohomology rings of tree braid groups**, with Daniel Farley
Journal of Pure and Applied Algebra, 212(1):53-71, 2007
- (3) **Embeddings of right-angled Artin groups into graph braid groups**
Geometriae Dedicata, 124:191-198, 2007
- (2) **Discrete Morse theory and graph braid groups**, with Daniel Farley
Algebraic and Geometric Topology, 5:1075-1109, 2005
- (1) **Geodesics in the braid group on three strands**
In *Group theory, statistics, and cryptography*, v.360 of *Contemporary Mathematics*, 133-150, 2004

IN PREPARATION

- (15) **Paths in the Sphere Complex**, with Patrick Reynolds
- (14) **A Classifying space for braided Thompson's group**
- (13) **LYM Inequalities for Graded Posets**, with Joshua Brown Kramer
- (12) **Submanifold projection for $Out(F_n)$** , with Dmytro Savchuk

COURSE NOTES

- (1) **A First Course in Complex Analysis**, with Matthias Beck, Gerald Marchesi, and Dennis Pixton

NON-MATHEMATICS PAPERS

- (3) **Optimizing Organic and Solid State Dye-Sensitized Solar Cell Structures**, by Joe Weiss, R. Reid Tobias, Lei Zhu, Stephanie Gomez, Lucas Sabalka, Peter N. Kariuki, Wayne E. Jones Jr., and Peter Borgesen. Submitted.
- (2) **Nanostructured Electron Transport Layers for Improved Solar Cell Efficiency**, by Joe Weiss, Kenneth H. Skorenko, Kyle LaFever, Peter N. Kariuki, Lucas Sabalka, Peter Borgesen, and Wayne E. Jones Jr. Submitted.
- (1) **Vapor Phase Polymerization of Poly(3,4-ethylenedioxythiophene) in Flexible Solid State Dye-Sensitized Solar Cells**, by Kenneth H. Skorenko, Nicholas A Ravvin, Steven Skylak, Peter N. Kariuki, Joe Weiss, Louis F.J. Piper, Lucas Sabalka, Peter Borgesen, and Wayne E. Jones Jr. Submitted.

SELECTED HONORS

- | | |
|---------------------|--|
| 2006 | Recipient of the UIUC Mathematics Department Irving Reiner Memorial Award for outstanding graduate scholastic achievement in the field of algebra |
| 2002-06 | National Science Foundation Graduate Research Fellowship |
| 2002-06 | VIGRE Graduate Fellowship from the UIUC Mathematics Department |
| 2002-Present | Member of Phi Beta Kappa national undergraduate honorary society |
| Aug 2002 | Graduated from University of Nebraska-Lincoln with a Bachelor of Science in Mathematics, Computer Science, and History , with minors in Physics and Psychology , both With Honors and With Highest Distinction |
| 2001-02 | Recipient of the Barry M. Goldwater Scholarship for American undergraduate students with outstanding potential in science and mathematics |
| 2001 | Nebraska nominee for the Rhodes Scholarship |
| 2001 | Semi-finalist for the Winston Churchill Scholarship |
| Summer 2000 | Chosen to attend the Park City Mathematics Institute's summer program in Computational Complexity Theory |
| Fall 1999 | Chosen to attend the Mathematics Advanced Study Semester at Pennsylvania State University; graduated with distinction |
| 1991, 2001 | Advanced to final round of International Collegiate Programming Contest ; team received Honorable Mention both times |

TALKS GIVEN

(Italics indicates invited address; Hyperlinks indicate slides available online)

- Oct 2011 [Special Session on Geometric, Combinatorial, and Computational Group Theory](#)
University of Utah
- Oct 2011 [Special Session on Algorithmic and Geometric Properties of Groups](#)
University of Nebraska-Lincoln
- Sep 2011 [Special Session on Geometry of Arithmetic Groups](#)
Cornell University
- Apr 2011 [Special Session on Computational Algebra, Groups, and Applications](#)
University of Nevada, Las Vegas
- Mar 2011 [Spring Topology and Dynamics Conference](#)
University of Texas at Tyler
- Dec 2010 [Wasatch Topology Conference](#)
University of Utah
- Oct 2010 [Workshop on the Geometry of the Outer Automorphism Group of a Free Group](#)
American Institute of Mathematics
- Oct 2010 [Approaches to Group Theory](#) (Ken Brown Conference)
Cornell University
- Sep 2010 [Colloquium](#)
University of Nebraska-Lincoln
- Mar 2010 [Spring Topology and Dynamics Conference](#)
Mississippi State University, Starkville
- Oct 2009 [Binghamton University Graduate Conference in Algebra and Topology](#)
Binghamton University
- May 2009 [Geometric and Combinatorial Methods in Group and Semigroup Theory](#)
(Meakinfest)
University of Nebraska-Lincoln
- Mar 2009 [Special Session on Geometric Group Theory](#)
University of Illinois at Urbana-Champaign
- Mar 2009 [Colloquium](#)
Lafayette College
- Mar 2009 [Colloquium](#)
San Jose State University
- Mar 2008 [Special Session on Geometric Group Theory](#)
Louisiana State University, Baton Rouge
- Mar 2008 [Spring Topology and Dynamics Conference](#)
University of Wisconsin, Milwaukee
- Oct 2007 [Colloquium](#)
Miami University of Ohio
- Oct 2007 [Postdoctoral Research Seminar](#)
MSRI Program in Geometric Group Theory
- Mar 2007 [Special Session on Combinatorial and Geometric Group Theory](#)
Miami University of Ohio
- Jul 2006 [Conference on Topology and Robotics, 2006](#)
Eidgenössische Technische Hochschule Zürich
- May 2006 [Conference on Combinatorial and Geometric Group Theory](#)
(A. Yu. Olshanskii conference)
Vanderbilt University
- Mar 2006 [Spring Topology and Dynamics Conference](#)
University of North Carolina-Greensboro

- Mar 2006** **Geometric Groups on the Gulf Coast Conference**
University of Southern Alabama
- Nov 2005** **Geometric and Probabilistic Methods in Group Theory & Dynamical Systems**
Texas A&M University
- Oct 2005** **Special Session on Geometric Methods in Group and Semigroup Theory**
University of Nebraska-Lincoln
- Jun 2005** **Asymptotic and Probabilistic Methods in Geometric Group Theory**
University of Geneva
- Apr 2005** **Special Session on Curvature in Group Theory and Combinatorics**
University of California-Santa Barbara
- Oct 2004** ***Special Session on Braids and Knots***
University of New Mexico-Albuquerque
- Oct 2004** ***Albany Group Theory Conference***
Albany, New York
- Oct 2003** **Special Session on Combinatorial and Statistical Group Theory**
Courant Institute
- Apr 2002** **Hudson River Undergraduate Mathematics Conference**
Hamilton College, New York
- Mar 2002** **Spring Topology and Dynamics Conference**
University of Texas at Austin

WORKSHOPS ATTENDED

- Oct 2010** ***Geometry of the Outer Automorphism Group of a Free Group***
American Institute of Mathematics
- Aug 2010** ***Geometric, Combinatorial, and Computational Group Theory***
Centre de Recherches Mathématiques
- Fall 2007** ***Geometric Group Theory; Teichmüller Theory and Kleinian Groups***
Mathematical Sciences Research Institute

SEMINAR TALKS

- Feb 2013** **Group Theory Seminar**, University of Illinois at Urbana-Champaign
- Oct 2012** **Combinatorics Seminar**, Washington University in St Louis
- Oct 2012** **Topology, Algebra, and Combinatorics Seminar**, University of South Florida
- Sep 2012** **Topology and Geometry Seminar**, Saint Louis University (3 talks)
- Feb 2012** **Combinatoric Seminar**, Cornell University
- Nov 2011** **CUNY Geometry and Topology Seminar**, City University of New York
- Feb 2011** **Collective Dynamics of Complex Systems**, Binghamton University
- Jan 2011** **Geometry and Topology Seminar**, The Ohio State University
- Nov 2010** **Geometry and Topology Seminar**, Binghamton University
- Sep 2010** **Groups, Semigroups, and Topology Seminar**, University of Nebraska-Lincoln
- Sep 2010** **Geometry and Topology Seminar**, Cornell University
- May 2010** **Combinatorics Seminar**, Kansas University
- Apr 2010** **Geometry and Topology Seminar**, Binghamton University
- Nov 2009** **Baumslag Seminar**, City University of New York
- Nov 2009** **Geometry and Topology Seminar**, Binghamton University
- Oct 2009** **Geometry and Topology Seminar**, Binghamton University
- Aug 2009** **Geometry and Topology Seminar**, University of Pennsylvania
- Feb 2009** **Toeholds in Topology Graduate Seminar**, Binghamton University
- Nov 2008** **Geometry/Topology Seminar**, University of California, Davis (3 talks)
- Nov 2008** **Student-Run Geometry/Topology Seminar**, University of California, Davis

- Sep 2008 **Geometry and Topology Seminar**, Cornell University
- Sep 2008 **Geometry and Topology Seminar**, Binghamton University
- May 2008 **Geometry and Topology Seminar**, University of California, Davis
- Oct 2007 **Topology Seminar**, Miami University of Ohio
- Apr 2007 **Algebra, Geometry, and Combinatorics seminar**, San Fransisco State University
- Jan 2007 **Geometry and Topology Seminar**, University of California, Davis
- Nov 2006 **Group Theory Seminar**, The Ohio State University
- Nov 2006 **Geometry and Topology Seminar**, University of California, Davis
- Apr 2006 **Group Theory Seminar**, The Ohio State University
- Apr 2006 **Dissertation Defense**, University of Illinois at Urbana-Champaign
- Apr 2006 **Group Theory Seminar**, University of Illinois at Urbana-Champaign
- Sep 2005 **Group Theory Seminar**, University of Illinois at Urbana-Champaign
- Feb 2005 **Group Theory Seminar**, University of Illinois at Urbana-Champaign
- Jun 2004 **Groups, Semigroups, and Topology**, University of Nebraska-Lincoln (3 talks)
- Apr 2002 **Groups, Semigroups, and Topology**, University of Nebraska-Lincoln

TALKS FOR STUDENTS

- Mar 2011 **Toeholds in Topology Graduate Seminar**, Binghamton University, on *Knots*
- Dec 2010 **Undergraduate Math Club**, Binghamton University, on *Graph Braid Groups*
- Nov 2010 **Toeholds in Topology**, Binghamton University, *informal*
- Apr 2010 **Toeholds in Topology**, Binghamton University, on *Discrete Morse Theory*
- Mar 2010 **Undergraduate Math Club**, Binghamton University, on *Graduate Schools*
- Oct 2009 **Toeholds in Topology**, Binghamton University (3 talks)
Basic Introduction to Outer Space; Outer Space & Stallings Foldings; Stallings Foldings
- Feb 2009 **Toeholds in Topology**, Binghamton University, on *CAT(0) Spaces*
- Mar 2008 **Research Focus Group Graduate Seminar**, University of California, Davis, on the *Haagerup Property*
- May 2008 **UC Davis Math Circle Junior High Seminar**, University of California, Davis, on *Expander Graphs*
- 2006-07 **Research Focus Group Graduate Seminar**, University of California, Davis (multiple talks)

SERVICE

- Referee for:** Algebraic and Geometric Topology; Bulletin of the Malaysian Mathematical Sciences Society; Geometriae Dedicata; Homology, Homotopy, and Applications; London Mathematical Society Journal of Computation and Mathematics; National Security Agency; Topology and its Applications; Topology Proceedings; Transactions of the American Mathematical Society; Fonds de Recherche du Québec; Michigan Mathematics Journal; Journal of Physics A: Mathematical and Theoretical; Expositiones Mathematicae
- Aug 2011** Panelist, Binghamton Harpur College panel on Life and Work as a New Faculty Member
- 2011-present** Mathematical consultant for Dr. Paul Hanson for ecosystem variability project
- 2010-present** Contributing author, Binghamton Press & [Sun Bulletin Ask-a-Scientist column](#)
- 2009-present** Mathematical consultant for the Wayne Jones Flexible Solar Cell group
- 2009-present** Participant in Collective Dynamics of Complex Systems group ([talk listed](#))
- 2009-present** Mathematical consultant for Hiroki Sayama, assistant professor of bioengineering, head of [Collective Dynamics of Complex Systems](#) group
- 2009-present** Organizer, Binghamton Toeholds in Topology graduate seminar ([talks listed](#))
- 2009-present** Speaker, Binghamton Undergraduate Math Club ([talks listed](#))
- Apr 2009** Invited speaker at New Approaches to Scholarly Communications and Publishing Symposium, an interdisciplinary workshop by the Binghamton University Library
- Jan-May 2008** Principle organizer of Davis Geometric Group Theory Research Focus Group, including graduate seminar series ([talk listed](#))
- Aug 2007** Co-organizer of the week-long Davis Algebra Preliminary Exam Review Workshop
- 2006-2007** Co-organizer, Davis Geometric Group Theory Research Focus Group, including graduate seminar series; presented multiple times (individual talks not listed)
- 2006-2007** Committee member for the AMS Initiative on the Doctorate, a follow-up of the Carnegie Initiative on the Doctorate
- 2003-2005** Graduate representative for University of Illinois at Urbana-Champaign Mathematics to Carnegie Initiative on the Doctorate; attended national convening
- 2004-2005** Graduate Student Representative on University of Illinois at Urbana-Champaign Mathematics Department Graduate Affairs Committee
- 2000-2001** President, Pi Mu Epsilon Honorary National Mathematics Society, University of Nebraska-Lincoln Nebraska Alpha chapter

RESEARCH MENTORSHIP

- Summer 2008-
Dec 2010** Two undergraduate students in a Research Experience at University of California, Davis, researching open questions on graph braid groups on graphs, resulting in two research papers submitted for publication to date
- Jan-May 2008** Two students, one graduate and one undergraduate, in extended mentorship for Research Focus Group at University of California, Davis
- Summer 2007** One undergraduate student in Research Experience in online mobile robot navigation at University of California, Davis, resulting in a simulated motion algorithm
- Mar-Aug 2007** Two undergraduate students in Research Experience on the symmetric groups at University of California, Davis, with reading course and research components

TEACHING

SAINT LOUIS UNIVERSITY (Assistant Professor)

| Semester | Course | Book | Students |
|-------------|----------------------------|----------------------|----------|
| SPRING 2013 | Math 142 Calculus I | Hughes-Hallett et al | 35 |
| SPRING 2013 | Math 142 Calculus I | Hughes-Hallett et al | 35 |
| FALL 2012 | Math 142 Calculus I | Hughes-Hallett et al | 29 |
| FALL 2012 | Math 142 Calculus I | Hughes-Hallett et al | 23 |

BINGHAMTON UNIVERSITY (Riley Assistant Professor)

| Semester | Course | Book | Students |
|-------------|---|------------------------|----------|
| SPRING 2012 | Math 601A Mapping Class Groups & $Out(F_n)$ | Farb & Margalit, Other | 7 grads |
| FALL 2011 | Math 330 Number Systems (proofwriting) | Beck & Geoghegan | 26 |
| FALL 2011 | Math 323 Calculus III | Stewart | 37 |
| SPRING 2011 | Math 375 Complex variables | Authored Course Notes | 38 |
| FALL 2010 | Math 461 Topology I | Bloch | 25 |
| FALL 2010 | Math 130 Mathematics in Action | Course Notes | 280 |
| SPRING 2010 | Math 130 Mathematics in Action | Course Notes | 162 |
| FALL 2009 | Math 222 Calculus II | Stewart | 44 |
| FALL 2009 | Math 222 Calculus II | Stewart | 45 |
| SPRING 2009 | Math 222 Calculus II | Stewart | 35 |
| SPRING 2009 | Math 375 Complex variables | Authored Course Notes | 18 |

UNIVERSITY OF CALIFORNIA, DAVIS (Krener Assistant Professor)

| Quarter | Course | Book | Students |
|-------------|---|---|----------|
| FALL 2008 | 295 Graduate Reading Course | Burago, Burago, & Ivanov A course on metric geometry | 5 grads |
| FALL 2008 | 16A Basic Calculus I | Larson & Edwards | 262 |
| SPRING 2008 | 147 Basic Topology | Munkres | 30 |
| WINTER 2008 | 16A Basic Calculus I | Larson & Edwards | 203 |
| SPRING 2007 | 141 Euclidean and non-Euclidean geometry | Greenberg; Lecture Notes | 30 |
| SPRING 2007 | 147 Basic Topology | Munkres | 30 |
| WINTER 2007 | 295 Graduate Reading Course | (topic: braid groups) | 6 grads |
| WINTER 2007 | 16B Basic Calculus II | Larson & Edwards | 90 |
| FALL 2006 | 210A Graduate Topics Course | (topic: geometric group theory) | 12 grads |

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN (Graduate Teaching Assistant)

| Semester | Course |
|-------------|--|
| 2006 | (Received Graduate Teaching Certificate) |
| SPRING 2006 | 221 Introductory Matrix theory stand-alone course; Ranked as Excellent Teacher |
| FALL 2005 | 221 Introductory Matrix theory stand-alone course; Ranked as Excellent Teacher |

UNIVERSITY OF NEBRASKA-LINCOLN (Undergraduate Teaching Assistant)

| Semester | Course |
|-----------------|---------------------------------|
| SPRING 2002 | 208H Honors Calculus III |
| FALL 2001 | 107H Honors Calculus II |
| SPRING 2001 | 208H Honors Calculus III |
| FALL 2000 | 107H Honors Calculus II |