

# Joshua Roberts

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## Education

Ph.D. Mathematics, University of Kentucky, 2010.

DISSERTATION: Algorithms for Upper Bounds of Low Dimensional Group Homology.

*Dissertation Committee:* Marion Anton (advisor and co-chair), Edgar Enochs (co-chair), Serge Ochanine, Andrew Klapper, and Alfred Shapere.

M.A. Mathematics, University of Kentucky, 2006.

B.S. Mathematics, University of Virginia - Wise, 2004.

*Minors:* Physics and Philosophy.

## Research Interests

My research focuses on the computational aspects of algebraic topology, particularly its interactions with algebraic K-theory and group homology. Most recently, developing algorithmic methods to study low dimensional group homology. I am especially interested in the exciting new field of applied algebraic topology.

## Publications

*An algorithm for low dimensional group homology.* Homology, Homotopy, and Applications, **12** (2010), 27-37, URL <http://www.intlpress.com/HHA/v12/n1/a3/>.

*Generators for homology via Hopf's Formula.* (In progress).

*Topological interpretation of Milnor's  $K_2$ .* (In progress).

## Teaching Experience

### Piedmont College, Department of Mathematics and Physics

*Math 212, Calculus II*, Fall 2010.

*Math 420, College Geometry*, Fall 2010.

*Math 460, Real Analysis*, Fall 2010.

### University of Kentucky, Department of Mathematics

**Algebra Cubed Fellow:** Duties included working one-on-one with a high school math teacher, developing conceptual lesson plans, weekly journaling, and bi-monthly group meetings (academic year 2006).

Algebra Cubed <http://www.ms.uky.edu/algebracubed/> is the result of a GK-12 grant that brings math, science, and engineering graduate students into the high school classroom to serve as math specialists in Bath and Powell county schools located in the Appalachian region of Kentucky. The program is centered around the idea of conceptual learning. Graduate students were expected to develop conceptual lesson plans based on hands-on activities that allow the students to understand the underlying mathematical principles rather than blindly carrying out procedures.

**Primary Instructor:**

*Math 123, Elementary Calculus*, Summer 2010.  
*Math 322, Linear Algebra*, Summer 2009.  
*Math 114, Calculus II*, Spring 2009.  
*Math 113, Calculus I*, Fall 2008.  
*Math 322, Linear Algebra*, Summer 2008.  
*Math 202, Mathematics for Elementary Teachers II*, Spring 2008.  
*Math 201, Mathematics for Elementary Teachers I*, Fall 2007.  
*Math 111, Introduction to Contemporary Mathematics*, Spring 2006.  
*Math 109, College Algebra*, Fall 2005.

**Teaching Assistant:**

*Math 113, Calculus I*, Spring 2005.  
*Math 162, Finite Mathematics*, Fall 2004.

## Presentations

“Algorithms for Upper Bounds of Low Dimensional Group Homology,” Dissertation Defense, University of Kentucky, April 2010.

“Generalized Cohomology Theories,” Geometry and Topology Seminar, University of Kentucky, February 2010.

“Topological Interpretation of Milnor’s  $K_2$ ,” Geometry and Topology Seminar, University of Kentucky, December 2009.

“A Conjecture of Quillen and Algorithms for Group Homology,” Algebra and Geometry Seminar, University of Kentucky, December 2009.

“Topological Data Analysis,” Mathematics Colloquium, Centre College, November 2009.

“A Gentle Introduction to Spectral Sequences,” Geometry and Topology Seminar, University of Kentucky, September, 2009.

“Applied Algebraic Topology: Persistent Homology,” Graduate Student Colloquium, University of Kentucky, September, 2009.

“A Topological Introduction to Group Homology,” Graduate Student Colloquium, University of Kentucky, August 2009.

“An Algorithm for Low Dimensional Group Homology,” Joint Mathematics Meetings, Washington D.C., January 2009.

“The Grothendieck Group,” Graduate Student Colloquium, University of Kentucky, September 2008.

“Group Presentations and 2-Dimensional CW-Complexes,” Graduate Student Colloquium, University of Kentucky, February 2008.

“Group Cohomology and Algebraic K-Theory: A Classifying Space Perspective,” Geometry and Topology Seminar, University of Kentucky, December 2007.

“Generalizing the Cantor-Bernstein Theorem,” Graduate Student Colloquium, University of Kentucky, November 2007.

“Classifying Spaces and Applications,” Graduate Student Topology Conference, University of Chicago, April 2007.

“Classifying Spaces and Higher K-Theory,” Graduate Student Colloquium, University of Kentucky, April 2007.

“Hopf’s Formula and Milnor’s  $K_2$ ,” Geometry and Topology Seminar, University of Kentucky, Spring 2006.

“The Degree Modulo 2 of a Mapping,” Geometry and Topology Seminar, University of Kentucky, October 2005.

“An Investigation of  $\ell^2$ ,” Capstone Course Presentation, University of Virginia-Wise, April 2004.

## Fellowships, Honors, and Awards

Project NExT Fellowship, 2010-2010.

Project NExT is a competitive national professional development program of the Mathematical Association of America for new mathematics faculty. NExT stands for “New Experiences in Teaching”.

Teacher Who Made a Difference, College of Education, University of Kentucky, Spring 2010.

Dissertation Year Fellowship, University of Kentucky, July 2009 - June 2010.

Phi Kappa Phi Honor Society Inductee, University of Kentucky, Fall 2009.

Wimberly C. Royster Outstanding Teaching Assistant Award, University of Kentucky, Spring 2008.

Algebra Cubed Fellowship, University of Kentucky, Fall 2006 - Summer 2007.

Research Assistantship, University of Kentucky, Summer 2006.

Research Assistantship, University of Kentucky, Summer 2005.

Theodore-Gibson Award for Excellence in Mathematics, University of Virginia - Wise, Spring 2003.

Sigma-Zeta National Science and Mathematics Honor Society Inductee, University of Virginia - Wise, Spring 2003.

Darden Honor Society Inductee, University of Virginia - Wise, Spring 2003.

Judd Lewis Award for Excellence in Philosophy, University of Virginia - Wise, Spring 2002.

Dean’s List, University of Virginia-Wise, Fall 2001-Spring 2004.

## Conferences Attended

Joint Mathematics Meeting, New Orleans, LA, 6-9 January 2011 (planning to attend).

Project NExT and MathFest, Pittsburgh, PA, 2-7 August 2010.

Joint Mathematics Meeting, San Francisco, CA, 13-16 January 2010.

MSRI Conference on Algebra and Topology in Interaction, University of California - Davis, 11-13 September 2009.

NSF/CBMS Regional Conference on Algebraic Topology in Applied Mathematics, Cleveland State University, 3-7 August 2009.

2<sup>nd</sup> Bluegrass Algebra Conference, University of Kentucky, 6-8 March 2009.

Joint Mathematics Meeting, Washington D.C., 5-8 January 2009.

Graduate Student Topology Conference, University of Chicago, April 2007.

IMA Summer School: Topology and Its Applications (3 week program), University of Mississippi, July 2006.

Graduate Student Topology Conference, Indiana University, April 2006.

Maryland-D.C.-Virginia Mathematical Association of America Sectional Meeting, Norfolk University, April 2003.

## University Service

### *Graduate Student Council*

University of Kentucky, Fall 2009-Spring 2010.

### *Mathematics Graduate Student Orientation*

Co-organized and participated in student panel on research and teaching, Fall 2005, 2007, 2008, and 2009.

Co-organized and participated in role-playing activity to illustrate classroom situations for new graduate students, Fall 2005, 2007, 2008, and 2009.

### *University Graduate Student Orientation*

**MicroTeach Leader:** Teaching Assistant Orientation, University of Kentucky, Fall 2008. As a MicroTeach leader, I supervised a group of ten new teaching assistants from various disciplines such as psychology, Spanish, and biology, and guided them through a “MicroTeach” process, culminating in an 8-minute video-recorded teaching session. Afterwards we reviewed the video-recordings together and discussed their teaching performance and ways to improve.

### *Kentucky Academy of Science*

Served as judge for the annual math and science fair for high school students, mathematics and computer science subject, University of Kentucky, Spring 2008 and 2009.

## Skills

### *Languages*

Fluent in American Sign Language, minor reading fluency in French.

### *Computer*

GAP, KANT, L<sup>A</sup>T<sub>E</sub>X, Maple, Mathematica, Matlab, Plex, standard office suites.

## Professional Memberships

**Mathematical Association of America**, Member 2010-present.

**American Mathematical Society**, Member, 2004-present.

**Society for Industrial and Applied Mathematics**, Member, 2004-present.

## References

Marion Anton (Advisor)  
Visiting Assistant Professor of Mathematics  
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Professor of Mathematics  
University of Kentucky  
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Serge Ochanine  
Professor of Mathematics  
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Carl Lee (Teaching)  
Professor of Mathematics  
University of Kentucky  
(859) 257-1405  
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Richard Millman (Algebra Cubed Coordinator)  
Director, Center for Education Integrating Science, Mathematics and Computing (CEISMC),  
Professor of the Practice of Mathematics  
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Last updated: July 27, 2010

<http://www.piedmont.edu/math/jroberts/cv.pdf>