

# Joshua Roberts

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## Education

Ph.D. Mathematics, University of Kentucky, expected graduation May 2010.

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

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

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

*Minors:* Physics and Philosophy.

## Research Interests

Algebraic topology and its computational aspects, particularly its interactions with algebraic K-theory and computational group homology. Most recently, developing methods to study low dimensional group homology via experimental mathematics. In the future I plan to continue my study of the computational aspects of algebraic topology. I am especially interested the exciting new field of applied algebraic topology.

## Teaching Experience

*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:** Duties included designing syllabi, writing and grading homework and exams, lecturing and leading class discussions, and holding office hours.

*Math 322, Linear Algebra*, University of Kentucky, Summer 2009.

*Math 114, Calculus II*, University of Kentucky, Spring 2009.

*Math 113, Calculus I*, University of Kentucky, Fall 2008.

*Math 322, Linear Algebra*, University of Kentucky, Summer 2008.

*Math 202, Mathematics for Elementary Teachers II*, University of Kentucky, Spring 2008.

*Math 201, Mathematics for Elementary Teachers I*, University of Kentucky, Fall 2007.

*Math 111, Introduction to Contemporary Mathematics*, University of Kentucky, Spring 2006.

*Math 109, College Algebra*, University of Kentucky, Fall 2005.

**Recitation Instructor:** Duties included leading recitation sections, grading quizzes and exams, and holding office hours.

*Math 113, Calculus I*, University of Kentucky, Spring 2005.

*Math 162, Finite Mathematics*, University of Kentucky, Fall 2004.

## Publications

*An algorithm for low dimensional group homology.* Accepted for publication in *Homology, Homotopy, and Applications*, International Press. (Available online at <http://arxiv.org/abs/0901.2610>).

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

## Presentations

"A Topological Introduction to Group Homology," University of Kentucky, August 2009.

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

"The Grothendieck Group," University of Kentucky, September 2008.

"Group Presentations and 2-Dimensional CW-Complexes," University of Kentucky, February 2008.

"Group Cohomology and Algebraic K-Theory: A Classifying Space Perspective," University of Kentucky, December 2007.

"Generalizing the Cantor-Bernstein Theorem," University of Kentucky, November 2007.

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

"Classifying Spaces and Higher K-Theory," University of Kentucky, April 2007.

"Hopf's Formula and Milnor's  $K_2$ ," University of Kentucky, Spring 2006.

"The Degree Modulo 2 of a Mapping," University of Kentucky, October 2005.

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

## Conferences Attended

AMS Spring Southeastern Sectional Meeting, University of Kentucky, 27-28 March, 2010 (planning to attend).

Joint Mathematics Meeting, San Francisco, CA, 13-16 January 2010 (planning to attend).

Finitely Presented Groups: Where do we go from here, The City College of New York, 1-2 October, 2009 (planning to attend).

MSRI Conference on Algebra and Topology in Interaction, University of California - Davis, 11-13 September 2009 (planning to attend).

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.

## Honors and Awards

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

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.

## University Service

### *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.

### *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.

*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.

**Skills***Languages*

Fluent in English and American Sign Language, 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**

**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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Richard Millman (Algebra Cubed Coordinator)  
Director, Center for Education Integrating Science, Mathematics and Computing (CEISMC),  
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