

# Arunima Ray

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## Research Interests

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Low-dimensional topology, particularly knot theory and its applications to 3- and 4-manifolds

## Education

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### Rice University

Houston, TX

PhD. Mathematics, 2014

Thesis advisor: Tim Cochran

Thesis title: *Casson towers and filtrations of the smooth knot concordance group*

M.A. Mathematics, 2012

### State University of New York, College at Geneseo

Geneseo, NY

B.A. Mathematics and Biochemistry, 2009

*summa cum laude*, Phi Beta Kappa

Honors in Mathematics

## Publications

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1. **Slice knots which bound punctured Klein bottles**  
*Algebraic & Geometric Topology*, 13(5): 2713–2731, 2013. DOI:10.2140/agt.2013.13.2713.
2. **Injectivity of satellite operators in knot concordance**  
(with Tim D. Cochran and Christopher W. Davis)  
*Journal of Topology*, Advance Access published April 1, 2014. DOI: 10.1112/jtopol/jtu003.
3. **Injectivity of satellite operators in knot concordance** (Research Report)  
(with Tim D. Cochran and Christopher W. Davis)  
*Oberwolfach Reports*, 9(12): 1698–1701, 2012. DOI:10.4171/OWR/2012/28.
4. **Satellite operators as group actions on knot concordance**  
(with Christopher W. Davis)  
Submitted, 2013. Available at <http://arxiv.org/abs/1306.4632>.
5. **Casson towers and filtrations of the knot concordance group**  
Submitted, 2013. Available at <http://arxiv.org/abs/1309.7532>.
6. **Satellite operators with distinct iterates in smooth concordance**  
Submitted, 2014. Available at <http://arxiv.org/abs/1403.3883>.

## Awards and Honors

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- **Nettie S. Autrey Fellowship**  
Rice University Office of Graduate & Postdoctoral Studies, 2013–14; awarded annually to a single graduate student in the Schools of Natural Sciences or Engineering.
- **Robert Lowry Patten Award**  
Rice University Graduate Student Association, 2013; one of four annual awards recognizing service towards improving graduate student life and education.
- **President’s Graduate Fellowship**  
Rice University Office of Graduate & Postdoctoral Studies, 2009–10; awarded to ten incoming graduate students across all departments.
- **Excellence in Mathematics Award**  
SUNY Geneseo Mathematics Department, 2009; awarded to seven outstanding graduating students in the Department of Mathematics.
- **Presidential Scholar**  
SUNY Geneseo, 2007–09; ~15 high-achieving seniors are annually selected to serve as ambassadors of the college.

## Presentations

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### Invited Talks

1. **Satellite operations on knots, and fractals**, STEM Colloquium, University of Wisconsin–Eau Claire, March 7, 2014
2. **The fractal nature of the knot concordance group**, Joint Mathematics Meetings, Baltimore, MD, January 18, 2014
3. **Satellite operators as group actions on knot concordance**, AMS Central Sectional Meeting, Washington University at St. Louis, October 20, 2013
4. **Casson towers and filtrations of the smooth knot concordance group**, AMS Central Sectional Meeting, Washington University at St. Louis, October 19, 2013
5. **Satellite operators with distinct iterates in smooth concordance**, Stulken Topology Seminar, Rice University, September 9, 2013
6. **Casson towers and filtrations of the smooth knot concordance group**, Stulken Topology Seminar, Rice University, August 26, 2013
7. **There exist infinitely many unknotted winding number one satellite operators on knot concordance**, Lehigh University Geometry and Topology Conference, Lehigh University, May 25, 2013
8. **A friendly introduction to knots in three and four dimensions**, Mathematics Department Colloquium, SUNY Geneseo, April 25, 2013
9. **Slice knots which bound Klein bottles**, AMS Central Sectional Meeting, University of Akron, October 21, 2012
10. **Injectivity of satellite operators in knot concordance**, Stulken Topology Seminar, Rice University, August 27, 2012
11. **Slice knots which bound Klein bottles**, Stulken Topology Seminar, Rice University, August 20, 2012

## Selected Talks at Rice University

1. **Casson towers and filtrations of the smooth knot concordance group**, PhD Defense, Rice University, April 8, 2014
2. **From  $CFK^-(K)$  to  $\widehat{CFD}(S^3 - K)$** , Heegaard–Floer “computationar”, Rice University, April 2, 2014
3. **Calculating the concordance invariant epsilon from Knot Floer homology**, Heegaard–Floer “computationar”, Rice University, February 19, 2014
4. **An introduction to the concordance invariant epsilon from Knot Floer homology**, RTG Topology Seminar, Rice University, February 14, 2014
5. **Akbulut’s corks and exotic smooth structures on 4–manifolds**, RTG Topology Seminar, Rice University, September 27, 2013
6. **A brisk introduction to Legendrian/transverse knots and the slice–Bennequin inequality**, VIGRE Topology Seminar, Rice University, January 29, 2013
7. **Symmetries of knots**, VIGRE Topology Seminar, Rice University, September 21, 2012
8. **Random walks and generating functions**, Current Mathematics Seminar, Rice University, September 6, 2012
9. **Kinky disks and Casson handles**, VIGRE Topology Seminar, Rice University, April 3, 2012
10. **Introducing the uncertainty principle in mathematics**, Current Mathematics Seminar, Rice University, February 2, 2012
11. **On the signature of even 4–manifolds**, VIGRE Topology Seminar, Rice University, September 20, 2011
12. **Introducing the Arf invariant**, Student Summer Knot Invariants Seminar, Rice University, July 11, 2011
13. **A duality theorem for infinite cyclic coverings**, VIGRE Topology Seminar, Rice University, April 19, 2011
14. **Infinitely many hats, the axiom of choice, and predicting the future**, Current Mathematics Seminar, Rice University, April 7, 2011
15. **An introduction to the topological entropy of a dynamical system**, Current Mathematics Seminar, Rice University, February 25, 2010

## Teaching Experience

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### Instructor

- **Rice Emerging Scholars Program**, Rice University, Summer 2012
- **MATH 102: Calculus II**, Rice University, Fall 2011
- **MATH 102: Calculus II**, Rice University, Summer 2011
- **BIOL 188: General Biology Laboratory**, SUNY Geneseo, Fall 2007
- **BIOL 120: General Biology Laboratory II**, SUNY Geneseo, Spring 2007
- **BIOL 118: General Biology Laboratory I**, SUNY Geneseo, Fall 2006

### Teaching Assistant

- **MATH 445/540: Algebraic Topology**, Rice University, Spring 2014

- MATH 444/539: **Geometric Topology**, Rice University, Fall 2013
- MATH 304: **Elements of Knot Theory**, Rice University, Spring 2013
- MATH 354: **Honors Linear Algebra**, Rice University, Fall 2012
- MATH 300: **Basic Concepts in the Theory of Dynamical Systems**, Rice University, Fall 2012
- MATH 355: **Linear Algebra**, Rice University, Fall 2012
- MATH 101: **Calculus I**, Rice University, Spring 2012
- MATH 112: **Fundamental Theorem of Calculus II**, Rice University, Spring 2012
- MATH 211: **Ordinary Differential Equations & Linear Algebra**, Rice University, Spring 2011
- MATH 212: **Multivariable Calculus**, Rice University, Fall 2010
- MATH 102: **Calculus II**, Rice University, Spring 2010 and Fall 2009

### Training and Professional Development

- **Scientia Conference on Research and Innovation in Undergraduate Science and Engineering Education**, Rice University, February 2011
- **Graduate Teaching Seminar**, Rice University, 2009–11

## Service and Leadership

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- **Referee**, *Journal of Knot Theory & its Ramifications*
- **Reviewer**, *Mathematical Reviews*, Zentralblatt MATH
- **Center for Teaching Excellence Working Group**, Graduate Student Association Representative, Rice University, 2013–14
- **Increasing Diversity in STEM and Ways in which High School and Middle School girls can make contributions: A Panel Discussion**, Panelist, Sonia Kovalevsky Day, University of Wisconsin–Eau Claire, 2014
- **Graduate Committee**, Graduate Student Liaison, Rice University Mathematics Department, 2010–2013
- **Graduate Student Association**, Mathematics Department Representative, Rice University, 2009–2013
- **Women in Grad School: A Panel Discussion**, Panelist, Women’s Resource Center, Rice University, 2012
- **Graduate Student Association**, Graduate Centennial Committee Co-Ordinator, Rice University, Fall 2012
- **University Council**, Graduate Student Association Representative, Rice University, 2010–12
- **Graduate Student Association**, Orientation Co-Ordinator, Rice University, 2011
- **I Know What You Should Do Next Summer: A Panel Discussion**, Panelist, Nebraska Conference for Undergraduate Women in Mathematics, 2009
- **Department of Residence Life**, Resident Assistant, SUNY Geneseo, 2006–08

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## Conferences

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1. AMS Central Sectional Meeting, University of Wisconsin–Eau Claire, September 2014
2. Joint Mathematics Meetings, Baltimore, MD, January 2014
3. Tech Topology Conference, Georgia Institute of Technology, December 2013
4. AMS Central Sectional Meeting, Washington University at St. Louis, October 2013
5. Rolfsenfest; Low-dimensional topology, knots, and orderable groups, International Center of Mathematical Meetings, July 2013
6. Lehigh University Geometry and Topology Conference, Lehigh University, May 2013
7. Hempelfest; 3-manifolds: Heegaard splittings, the curve complex, and hyperbolic geometry, Rice University, April 2013
8. Texas Geometry and Topology Conference, Rice University, November 2012
9. Midwest Topology Seminar, Michigan State University, October 2012
10. AMS Central Sectional Meeting, University of Akron, October 2012
11. Texas Algebraic Geometry Seminar, Rice University, April 2011
12. The Fifth Triennial Ahlfors–Bers Colloquium, Rice University, March 2011
13. Nebraska Conference for Undergraduate Women in Mathematics, University of Nebraska - Lincoln, February 2009
14. Nebraska Conference for Undergraduate Women in Mathematics, University of Nebraska - Lincoln, February 2008
15. Frontiers in Applied and Computational Mathematics, New Jersey Institute of Technology, May 2007
16. Joint Mathematics Meetings, New Orleans, January 2007
17. Hudson River Undergraduate Mathematics Conference, Skidmore College, April 2006

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Last updated May 23, 2014