

Laura Zirbel

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Relevant Work Experience

Tutor and Grader at LMU Sep 2004 - May 2007
Teaching Assistant at UCSB Sep 2007 - Jun 2009
Mathlab Tutoring Staff, UCSB Sep 2007 - May 2009, Sep 2010 - Mar 2012
Coordinator for UCSB Math Circle Sep 2009 - Jun 2010
Teaching Associate (Instructor of Record) Jun 2010 - Sep 2012
TA Training Coordinator at UCSB Sep 2010
Teaching Assistant at UCSB Sep 2010 - Mar 2012

Education

BA in Mathematics, LMU, September 2003 - May 2007
Masters in Mathematics, UCSB, with area exams in Analysis, Topology and Algebra, September 2007 - June 2010

Publications

Lissajous knots and knots with Lissajous projections J. Hoste, L. Zirbel. Kobe Journal of Mathematics, vol. 24, no. 2. (2007)
Senior Thesis: *The Congruent Number Problem and Elliptic Curves* under the direction of Michael Berg. (2007)
Characteristics of shape and knotting in ideal rings Laura Zirbel and Kenneth C Millett 2012 J. Phys. A: Math. Theor. 45 225001

Research Interests

Long strings of connected molecules, called polymers, are central structures in life and physical sciences, as well as engineering. Prominent examples are DNA, proteins, polystyrene, and silicone. With regard to DNA, Fiers and Sinsheimer first showed that DNA of a specific virus is a single-stranded ring. Because of this closure condition, DNA, like other closed polymers, can be knotted. In 1976, Liu et al. discovered examples of knotted DNA, which was followed by the discovery of

topoisomerases, enzymes which knot and unknot DNA. These discoveries suggest that knotting plays an important role in the behavior and shape of DNA and other polymers.

My research has focused on both theoretical results and numerical simulations exploring how knotting effects the shape and behavior of polymers, for various polymer models.

Research Presentations

Lissajous and second-order Lissajous knots , MAA Undergraduate Poster Session , San Antonio, TX, Jan 14, 2006.

The Higher Dimensional Frobenius Problem , with Matthew Richer and Olga Lepigina, MAA Undergraduate Poster Session , New Orleans, LA, Jan 7, 2007

The Global and Local Shape of Regular Embedded Polygons Poster Session, IMA Special Workshop on Physical Knotting and Linking and its Applications, Apr 9, 2010

Random Embedded Polygons and Characteristics Correlated with Knotting, Graduate Student Topology Seminar, UCSB, October 29, 2010

Random Embedded Polygons and Characteristics Correlated with Knotting, Women in Math Symposium, Claremont McKenna College, Nov 20, 2010

The Relationship between Average End to End Distance, Average Radius of Gyration and Knotting with Various Models, Advancement Talk, UCSB, Mar 7, 2011

Characteristics of Shape and Knotting in Ideal Rings and Walks with Excluded Volume, Graduate Student Topology Seminar, UCSB, October 14, 2011

Averages of subsegment end to end distance and radius of gyration in ideal rings, Special Session on Knotting in Linear and Ring Polymer Models, Spring Western Section Meeting of AMS, March 4, 2012

Technological Skills

Experience programming in Matlab, Perl with more limited work in C, C++, Python and Mathematica.

Knowledge of html and website design.

Familiarity with educational materials including iclicker, WebWork and Blackboard and Gauchospace. Please feel free to contact me for access to sample Gauchospace pages for classes I have taught.

Teaching: Teaching Associate Positions

34A, Calculus for Social and Life Sciences, Summer 2012

34B, Calculus for Social and Life Sciences, Summer 2010, Summer 2012

3C, Differential Equations and Linear Algebra, Summer 2010

Teaching: Teaching Assistant Positions

Math 3A and 3B, Differential and Integral Calculus, in Fall 2007, Winter 2008, Spring 2008, Fall 2008 and Fall 2011

Math 5A, Differential Equations and Linear Algebra, in Summer 2011

Math 6A, Vector Calculus, Fall 2012

Math 8, Transition to Higher Mathematics (Introduction to Proofs), in Winter 2012

Math 15, Precalculus, in Fall 2008

Math 34A-B, Calculus for Social and Life Sciences, in Summer 2008, Winter 2009 (Head TA), Fall 2010 and Summer 2011

Math 100A-B, Mathematics for Elementary Teaching, in Spring 2009, Summer 2009, Winter 2011 and Spring 2011

Teaching: Other Projects

Fall 2009 to Spring 2010: UCSB Math Circle Coordinator: The UCSB Math Circle is an after school program designed to bring mathematicians and mathematical scientists into direct contact with pre-college students. The goal is to engage highly-motivated students in a collaborative environment and foster the exploration and discovery of mathematical concepts that are beyond traditional curriculum.

Ready, SET, go!: on the mathematics of the game SET, Nov 2009

Meet the Pollys: all about polyhedra, Mar, 2010

Sudoku!: on the mathematics of Sudoku, Mar 2010

Problem Solving Seminar: Discussing and applying classic problem solving strategies, Apr 2010

Alphabetia: Making new number systems and analyzing historical examples, May, 2010

Tiles and Telescopes: on the mathematics of Escher, symmetries, and origami, May 2010

I also made problems for weekly homework, and graded it each week.

The Mathematics of Origami, Assisted Freshman Seminar taught by Jeffery Stopple, Robert Lang, Winter 2010

TA Training Coordinator for incoming graduate students, with Michael Yoshizawa and Professor Charles Akemann, UCSB 2010-2011.

Mentoring of first year students, 2008 - 2012.

The Mathematics of Sudoku, Assisted Freshman Seminar taught by Jeffery Stopple, Fall 2012.
We used the text *Taking Sudoku Seriously* by Jason Rosenhouse and Laura Taalman.

Committee and Organization Leadership

UCSB Math Circle co-founder, organizer and presenter 2009 - 2010.

Hypatian Seminar Organizing Committee 2008-2012.

Graduate Student Topology Seminar Organizing Committee 2009 - 2012.

Computer Programing Workshop co-founder and organizer 2012.