

I am interested in problems at the intersection of p -adic geometry and low-dimensional topology; e.g. comparison theorems relating the data of abelian varieties, Galois representations, and L -functions with invariants coming from Floer homology theories, knots, and dynamics.

Personal

Birthdate: May 08, 1996
Birthplace: Rapid City, South Dakota
Citizenship: United States

Educational History

2018– **Ph.D. in Mathematics**, *University of Texas at Austin*.
2014–2018 **B.Sc. in Mathematics**, *California Institute of Technology*.
2012–2014 **International Baccalaureate Diploma**.
2010–2014 **High School Diploma**, *Canyon del Oro High School, Arizona*.
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Employment History

Research Experience

2017–2018 **Research Assistant**, *Yi Ni*, Department of Mathematics, Caltech.
We are completing the realization problem for prism manifolds [2].

Summer 2017 **Summer Undergraduate Research Fellow**, *Yi Ni and Faramarz Vafaee*, Caltech.
We determined all prism manifolds $P(p, q)$ with $0 < p < q$ that can be obtained via integral Dehn surgery along a knot in S^3 [3].

Summer 2016 **Summer Undergraduate Research Fellow**, *Yi Ni and Faramarz Vafaee*, Caltech.
We determined all $P(p, q)$ with $p > 0$ and $q < 0$ that can be obtained via integral Dehn surgery along a knot in S^3 [4].

Summer 2015 **Summer Undergraduate Research Fellow**, *Pei-Yu Tsai*, Caltech.
Developed an algorithm that returns a conjecturally complete set of coset representatives for double cosets cut out of reductive groups.


2012–2014 **Optics Laboratory Intern**, *Brian Anderson*, University of Arizona.
Assistant in a Bose-Einstein condensate lab; studied quantum mechanics and built lasers.

Teaching Experience

2016–2018 **Math 1 Study Session Leader**, *Caltech Dean's Office*.
Organize and host weekly study sessions for Caltech freshman taking Math 1: *Calculus & Linear Algebra*

- Summer 2017 **Lead TA for Math 0**, *Bob Pelayo & Caltech Dean's Office*.
- Summer 2016 Graded assignments and provided resources for new Caltech students in the online course *Transition to Mathematical Proofs*. Responsible for hiring/organizing a team of TA's.
- 2016 **Grader**, *Art of Problem Solving*.
- 2015–2017 **Dean's Tutor**, *Caltech Dean's Office*, Algebra/ Number theory/Topology/Analysis.
- 2012–2014 **Tutor**, *Kumon*, Oro Valley, AZ.
- 2011–2012 **Tutor**, *The Tutoring Center*, Marana, AZ.

Service

- 2017–2018 **President, Caltech Math club**  .
Organized undergraduate talks and panels of grad students, visitors, and emeriti for the undergraduates.
- 2016–2017 **Secretary, Caltech Math club**.
- 2017–2018 **Instructor: MATHCOUNTS[®]**, *Walter Reed Middle School*.
- 2015–2017 **Instructor: Recreational Mathematics**, *Walter Reed Middle School*, Los Angeles.

Honors and Awards

- 2017 Joanna Wall Muir Research Fellow *Caltech Student-Faculty Program*
- 2017 Eric Temple Bell Undergraduate Mathematics Research Prize *Caltech Department of Mathematics*
- 2017 Patrick Hummel and Harry Gray Travel Grant *Caltech Y (Grant for AWS 2017)*

Conferences and Workshops

- Mar 3–7, 2018 **Arizona Winter School 2018: Iwasawa Theory**, *SWC*, University of Arizona.
- Aug 7–11, 2017 **Southeaster Undergraduate Mathematics Workshop**, *NSF Grant DMS-1552285*, Georgia Institute of Technology.
With W.B, presented on the prism manifold realization problem.
- Mar 11–15, 2017 **Arizona Winter School 2017: Perfectoid Spaces**, *SWC*, University of Arizona.
- Feb 22–23, 2016 **The Albert Leon Whiteman Memorial Mathematics Lectures**, USC.

Selected Talks Given

- Apr 27, 2018 Uniformization Theorems
- Mar 19, 2018 Toroidal Compactification of $U(2, 1)$ ball-quotients
- Jan 12, 2018 Solenoid embedding problems *Undergraduate math seminar*
- Dec 5, 2017 The syntomic site and p -adic regulators
- Dec 1, 2017 Intro to the adelic solenoid and galois groups *Undergraduate math seminar*
- Nov 29, 2017 Topological Realisations of Absolute Galois Groups
- Nov 28, 2017 Modular knots and elliptic curves
- Oct 21, 2017 The prism manifold realization problem II *Caltech SURF seminar day*
- Oct 17, 2017 The p -adic solenoid
- Jan 21, 2017 On arithmetic hyperbolic 3-manifolds *Undergraduate math seminar*

Oct 15, 2016	The prism manifold realization problem	<i>Caltech SURF seminar day</i>
Oct 14, 2016	Weird numbers	<i>Undergraduate math seminar</i>
Mar 4, 2016	Louville numbers	<i>Undergraduate math seminar</i>
Oct 30, 2015	Double Cosets: more structure = more fun	<i>Undergraduate math seminar</i>
Oct 17, 2015	Paramodular cosets in GSp_4	<i>Caltech SURF seminar day</i>

Most Recent Coursework

- Ma 98: p-adic Teichmüller Theory
- Ma 142: Partial Differential Equations
- Ma 191 b_2 : Shimura Varieties
- Ma 191 b_4 : Geometric Langlands'
- Ma 191 a_2 : Heegaard Floer Homology
- Ma 191 a_4 : p-adic Hodge theory
- Ma 135: Arithmetic Geometry
- Ma 98: Perfectoid spaces
- Ma 160: Number theory
- Ma 130: Algebraic Geometry

Languages

English	Native tongue	<i>All education conducted in English Read, write, and conversationally fluent Mathématiquement alphabétisé</i>
Spanish	Advanced	
French	Novice	
German	Beginner	

Publications

- [1] T. Ochse. "Arithmetic knots in homology spheres". In preparation. 2018.
- [2] W. Ballinger, Y. Ni, T. Ochse, and F. Vafaee. "The prism manifold realization problem III". In preparation. 2018.
- [3] W. Ballinger, Y. Ni, T. Ochse, and F. Vafaee. "The prism manifold realization problem II". In: (Sept. 2017). Submitted, available at. arXiv: 1710.00089 [math.GT].
- [4] W. Ballinger, C. Ching-Yun Hsu, W. Mackey, Y. Ni, T. Ochse, and F. Vafaee. "The prism manifold realization problem". In: (Dec. 2016). Submitted, available at. arXiv: 1612.04921 [math.GT].

References

Matthias Flach	Yi Ni	Faramarz Vafaee	Zavosh Amir-Khosravi
Professor of Mathematics, <i>Caltech</i> flach@caltech.edu	Professor of Mathematics, <i>Caltech</i> yini@caltech.edu	Harry Bateman Instructor in Mathematics, <i>Caltech</i> vafaee@caltech.edu	Olga Taussky John Todd Instructor in Mathematics, <i>Caltech</i> zavosh@caltech.edu