Benjamin Linowitz

Curriculum Vitæ

CONTACT INFORMATION:

Department of Mathematics, Oberlin College
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Oberlin, OH 44074

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EMPLOYMENT:

Oberlin College Fall 2016 - present
Assistant Professor

University of Michigan 2012 - 2016
NSF Postdoctoral Research Fellow / RTG Postdoctoral Assistant Professor

EDUCATION:

Ph.D. in Mathematics, Dartmouth College May 2012
Advisor: Tom Shemanske
Thesis: *Selectivity in central simple algebras and isospectrality*

M.A. in Mathematics, Dartmouth College May 2009

M.A. in Mathematics, University of Pennsylvania May 2006
Advisor: Ted Chinburg
Thesis: *An exposition of the AKS polynomial time primality testing algorithm*

B.A. in Mathematics, University of Pennsylvania May 2006
Summa Cum Laude with Honors in Mathematics

PERSONAL GRANTS AND AWARDS:

Simons Collaboration Grant ($42,000) 2017 - 2022

Project NExT Fellow (Green 16) 2016 - 2017

NSF Postdoctoral Research Fellowship ($120,000) 2013 - 2016

CONFERENCE GRANTS AND AWARDS:

NSF Algebra and Number Theory Award DMS - 1500710
(co-PI with M. Agarwal and L. Thompson) March 2015
Awarded $19220 to support the *2015 Automorphic Forms Workshop*

Number Theory Foundation Award
(co-PI with M. Agarwal and L. Thompson) March 2015
Awarded $4920 to support the *2015 Automorphic Forms Workshop*

PUBLICATIONS:

Areas of totally geodesic surfaces of hyperbolic 3-orbifolds, B. Linowitz, D.

B. McReynolds and N. Miller, submitted.

The Fourier coefficients of Eisenstein series newforms, B. Linowitz and L. Thompson, submitted.

Fake quadrics, B. Linowitz, M. Stover and J. Voight, submitted.

Counting and effective rigidity in algebra and geometry, B. Linowitz, D. B. McReynolds, P. Pollack and L. Thompson, submitted.

Counting isospectral manifolds, M. Belolipetsky and B. Linowitz, to appear in Advances in Mathematics.

Bounded gaps between primes and the length spectra of arithmetic hyperbolic 3-orbifolds, B. Linowitz, D. B. McReynolds, P. Pollack and L. Thompson, to appear in C. R. Math. Acad. Sci. Paris.

Counting problems for geodesics on arithmetic hyperbolic surfaces, B. Linowitz, to appear in Proc. Amer. Math. Soc.

Systoles of arithmetic hyperbolic surfaces and 3-manifolds, B. Linowitz, D. B. McReynolds, P. Pollack and L. Thompson, to appear in Math. Res. Lett.

On the isospectral orbifold-manifold problem for nonpositively curved locally symmetric spaces, B. Linowitz and J. Meyer, Geom. Dedicata 188 (2017), 165-169.

Bounds for arithmetic hyperbolic reflection groups in dimension 2, B. Linowitz, to appear in Transformation Groups.

Parameterizing Shimura subvarieties of A_1 Shimura varieties and related geometric problems, B. Linowitz and M. Stover, Archiv der Mathematik, 107(3), 213-226.

Local Selectivity of Orders in Central Simple Algebras, B. Linowitz and T. Shemanske, Int. J. Number Theory 13 (2017), no. 4, 853-884.

Locally equivalent correspondences, B. Linowitz, D. B. McReynolds and N. Miller, to appear in Annales de l'Institut Fourier.

The length spectra of arithmetic hyperbolic 3-manifolds and their totally geodesic surfaces, B. Linowitz, J. Meyer and P. Pollack, New York J. Math. 21 (2015), 955–972.

Systolic surfaces in arithmetic hyperbolic 3-manifolds, B. Linowitz and J. Meyer, to appear In the tradition of Ahlfors-Bers VII, Contemp. Math.

Selective orders in central simple algebras and isospectral families of arithmetic manifolds, B. Linowitz, Manuscripta Math. 147 (2015), no. 3, 399 - 413.

A non-commutative analogue of the Odlyzko bounds and bounds on performance for space-time lattice codes, B. Linowitz, M. Satriano and R. Vehkalahti, IEEE Trans. Inf. Theory, vol. 61, no. 4, pp. 1971-1984, April 2015.

Small isospectral and nonisometric orbifolds of dimension 2 and 3, B. Linowitz and J. Voight, Mathematische Zeitschrift, vol. 281, no. 1 (2015), pp. 523-569.

Families of mutually isospectral Riemannian orbifolds, B. Linowitz, Bull. London Math. Soc. (2015) 47 (1): 47-54.

The sign changes of Fourier coefficients of Eisenstein series, B. Linowitz and L. Thompson, Ramanujan J., 37 (2015), no. 2, 223-241.

On fields of definition of arithmetic Kleinian reflection groups. II, M. Belolipetsky and B. Linowitz, Int. Math. Res. Not. IMRN (2014), no. 9, 2559-2571.

Characterizing Hilbert modular cusp forms by coefficient size, B. Linowitz, Kyushu J. Math. 68 (2014) no. 1, 105-111.

A newform theory for Hilbert Eisenstein series, T. Atwill and B. Linowitz, Ramanujan J. 30 (2013), no. 2, 257-278.

Isospectral Towers of Riemannian Manifolds, B. Linowitz, New York J. Math. 18 (2012), 451–461.

Decomposition theorems for twists of Hilbert modular newforms, B. Linowitz, Funct. Approx. Comment. Math. 47 (2012), part 2, 157–172.

Embedding orders in central simple algebras, B. Linowitz and T. Shemanske, J. Théor. Nombres Bordeaux, 24 (2012), no. 2, 405–424.

(**Selectivity in quaternion algebras**, B. Linowitz, J. Number Theory 132 (2012), no. 7, 1425–1437.

Modular forms on noncongruence subgroups and Atkin-Swinnerton-Dyer relations, L. Fang, J. Hoffman, B. Linowitz, A. Rupinski and H. Verill, Exp. Math. 19 (2010), no. 1, 1–27.

UNDERGRADUATE MENTORING:

2017-2018: Nicholas Wilcox, Honor's Student. Project Title: Elliptic Curve Cryptography

Fall 2017: Yuan (Charles) Cui, Private Reading Course on Primality Testing.

TEACHING EXPERIENCE:

Oberlin College

Math 134: Calculus II	Fall 2017
Math 232: Linear Algebra	Spring 2017
Math 327: Group Theory	Spring 2017
FYSP 028: Cryptography	Fall 2016
Math 327: Group Theory	Fall 2016

University of Michigan

Math 175: Introduction to Cryptology Fall 2012, 2013, 2014

Math 567: Introduction to Coding Theory Winter 2013

Dartmouth College

Math 31: Abstract Algebra Summer 2011

Math 22: Linear Algebra Spring 2011

Math 2: Calculus with Algebra and Trigonometry Winter 2010

RESEARCH PRESENTATIONS:

Geodesics on hyperbolic surfaces, quaternion algebras, and the Chebotarev density theorem in short intervals January 2018
Joint Mathematics Meetings AMS Special Session: "A Showcase of Number Theory at Liberal Arts Colleges"

You cannot hear the shape of a hyperbolic drum August 2017
Colloquium, Universidad de los Andes, Bogotá, Colombia.

Totally geodesic surfaces in arithmetic hyperbolic 3-manifolds June 2017
32nd Summer Conference on Topology and its Applications, University of Dayton.

Systoles of arithmetic hyperbolic manifolds March 2017
Spring Topology and Dynamical System Conference, Jersey City University.

Bounds on the arithmetic genus of Hilbert modular varieties July 2016
Building Bridges: Workshop on Automorphic Forms, University of Sarajevo.

Selective orders in central simple algebras May 2016
Langenhop Lecture and Conference, Southern Illinois University at Carbondale.

You cannot hear the shape of a hyperbolic drum October 2015
Number Theory Seminar, Universidad Nacional de Córdoba - Argentina.

Classification of fake quadrics August 2015
Computational Aspects of Algebraic Geometry, Automorphic Forms, and Number Theory, Tsinghua Sanya International Mathematics Forum.

Selectivity in central simple algebras June 2015
12th Brauer Group Meeting, Pingree Park Mountain Campus of Colorado State University.

Can an orbifold be isospectral to a manifold? May 2015
Spring Topology and Dynamics Conference, Bowling Green State University.

Isospectral surfaces of small volume April 2015
Colloquium, University of Oklahoma.

Effective rigidity in spectral geometry April 2015
Geometry Seminar, University of Oklahoma.

Can an orbifold be isospectral to a manifold? April 2015
AMS Special Session on the Geometry of Manifolds, Singular Spaces, and Groups, Michigan State University.

Effective rigidity in spectral geometry November 2014
Geometry Seminar, University of Michigan.

Effective rigidity in spectral geometry October 2014

Ahlfors-Bers Colloquium VI

Counting central division algebras October 2014
Algebra, Number Theory and Combinatorics Seminar, University of Texas at Austin.

Counting central division algebras September 2014
Group Theory, Lie Theory and Number Theory Seminar, University of Michigan.

Quaternion orders and isospectral hyperbolic surfaces August 2014
ICM 2014 Satellite Conference on Integral Quadratic Forms, Seoul, Korea.

The sign changes of Fourier coefficients of Eisenstein series July 2014
Building Bridges: Workshop on Automorphic Forms, Bristol, UK.

Counting central division algebras May 2014
Number Theory Seminar, Dartmouth College.

Quaternion orders and isospectral hyperbolic surfaces March 2014
AMS southeastern spring sectional meeting special session on Geometric Topology and Number Theory.

You cannot hear the shape of a hyperbolic drum March 2014
Colloquium, Central Michigan University.

Quaternion orders and isospectral hyperbolic surfaces December 2013
International Conference on the Algebraic and Arithmetic Theory of Quadratic Forms, Puerto Natales, Patagonia, Chile.

Isospectral surfaces of small volume April 2013
Geometry Seminar, Purdue University.

When the product of eigenforms is an eigenform March 2013
The 27th Automorphic Forms Workshop, University College Dublin

You cannot hear the shape of a hyperbolic drum February 2013
VIGRE Seminar, University of Georgia.

Embedding orders in central simple algebras February 2013
Algebra Seminar, University of Georgia.

Lattice-theoretic methods in spectral geometry January 2013
Joint Mathematics Meetings AMS Special Session
on the Arithmetic of quadratic forms and lattices.

Quaternion orders and arithmetic hyperbolic geometry September 2012
Quebec-Maine Number Theory Conference

Coefficient growth for Hilbert modular forms August 2012
Building Bridges: The 1st EU-US conference on
Automorphic Forms and related topics, Aachen University

A newform theory for Hilbert Eisenstein series April 2012
The 26th Automorphic Forms Workshop, University of British Colombia

Quaternion orders and arithmetic hyperbolic geometry March 2012
Algebra Seminar, Wesleyan University

Quaternion orders and isospectral surfaces of small volume January 2012
Colloquium, Miami University

Quaternion orders and arithmetic hyperbolic geometry January 2012
Number Theory Seminar, University of Georgia

Selectivity in Quaternion Algebras January 2012

Joint Mathematics Meetings

A newform theory for Hilbert Eisenstein series October 2011
Maine-Quebec Number Theory Conference

Decomposition theorems for Hilbert modular forms May 2011
The Upstate New York Number Theory Conference

Decomposition theorems for Hilbert modular forms March 2011
The 25th Automorphic Forms Workshop, Oregon State University

Selectivity in quaternion algebras December 2010
Arithmetic of quadratic forms and integral lattices
Instituto de matematica y fisica, Universidad de Talca, Chile

Embedding orders into central simple algebras December 2010
Special session on the arithmetic of quadratic forms and integral lattices
Joint meeting of the AMS and Sociedad de matematica de Chile

Embedding orders into central simple algebras September 2010
Algebra Seminar, Wesleyan University

Embeddings and optimal embeddings in quaternion algebras July 2010
Canadian Number Theory Association XI meeting

Selectivity in quaternion algebras October 2009
Maine-Quebec Number Theory Conference

INVITED LECTURE SERIES:

The geometry of arithmetic hyperbolic 3*-manifolds* September-November 2015
Universidad Nacional de Córdoba - Argentina

This was a series of 11 lectures which introduced the audience to the construction of arithmetic hyperbolic 3-manifolds and the techniques used in the study of their topology and geometry. Particular attention was paid to applications in spectral geometry.

Computing with quaternion algebras in Sage and Magma Fall 2011
Dartmouth College

These lectures, aimed at advanced undergraduates, introduced the Sage and Magma computer algebra systems with an eye towards the arithmetic of orders in quaternion algebras.

PROFESSIONAL DEVELOPMENT:

Annual Legacy of R.L. Moore Conference June 2012, 2013, 2014

These workshops promote the design and implementation of effective methods of teaching and learning at all educational levels through the use of inquiry based learning (IBL) methods.

Ohio MAA - IBL Workshop October 2013

This workshop, led by Carol Schumacher of Kenyon College, introduced participants to the use of inquiry based learning (IBL) methods in the classroom and discussed the contexts in which IBL is effective and practical.

Authorship of Student Projects Based on Primary Historical Sources

April 2012

This workshop, hosted by New Mexico State University, provided instruction for the development of student project assignments based on primary historical sources.

Teaching Seminar Summer 2009

Intensive summer-long training course taken by Dartmouth's graduate students who have advanced to candidacy. Includes reading and discussion of material on the philosophy and science of learning and teaching. Participants also design and execute two week-long enrichment workshops for high school students to gain hands-on teaching experience.

SYNERGISTIC ACTIVITIES:

Undergraduate level talks

*How I became a mathematician & What the h*ck does number theory have to do with geometry and topology?*

Wake Forest University REU August 2017

The ABC Conjecture

Departmental Spring Banquet, Ohio Wesleyan University April 2017
Duquesne University Undergrduate Math Colloquium October 2016
University of Michigan Math Club September 2014
Central Michigan Univ. SUMMR Conference (keynote speaker) July 2013
Kalamazoo College October 2012

A Modular Forms Approach to Quadratic Forms

University of Michigan Math Club November 2013

Michigan Math and Science Scholars

Ann Arbor, MI June 2014

The Michigan Math and Science Scholars program offers high school students the opportunity to gain exposure to current developments and research in the sciences by taking a two week long course with a University of Michigan faculty member. During the last two weeks of June 2014 I taught a course titled *The Mathematics of Cryptography*. This course used inquiry-based learning methods to develop the elementary number theory necessary to understand the RSA cryptography system.

Faculty Advisor, Honors Freshman Orientation July 2013, 2014

Judge, MAA Undergraduate Poster Session January 2014

REU Mentor, University of Michigan Summer 2013

Joseph Richey and Noah Shutty
Project title: Polynomial identities on eigenforms
Paper published in the *Journal of Number Theory*.

Weston Ungemach
Project title: A bound on isospectral families and applications

University of Michigan Math Circle Lectures

Prime Number Patterns I April 11, 2013
Prime Number Patterns II April 18, 2013

Probability and Paradoxes I November 13, 2014
Probability and Paradoxes II November 20, 2014

The University of Michigan Math Circle aims to increase the quality and quantity of students who become mathematics educators and researchers by inviting area high school and middle school students to the University of Michigan for lectures on and discussions about mathematics.

Wolverine Express

Pontiac High School, Pontiac, MI February 2013

The Wolverine Express is a school visitation program in which a diverse group of University of Michigan faculty members visit high schools in under-resourced areas in order to promote academic success and college aspiration.

CONFERENCES ORGANIZED:

Mathematical Research Communities Summer 2018

I am a co-organizer of a 20-person conference at the 2018 Mathematical Research Communities program. The title of our conference is "Number Theoretic Methods in Hyperbolic Geometry".

AIM SQuaRE on **Towards the Classification of Arithmetic Hyperbolic Reflection Groups**, San Jose, CA Summer 2018

This AIM SQuaRE will be a small workshop with five mathematicians (including myself). I wrote a proposal which led to full funding of the workshop by the American Institute of Mathematics.

Collaborate@ICERM, Providence, RI Summer 2017

This will be a small workshop with four mathematicians. I wrote a proposal which led to full funding of the workshop by ICERM.

29th Automorphic Forms Workshop, University of Michigan March 2015

Interactions Between Geometry, Group Theory and Number Theory, Special session at the AMS meeting at Michigan State University. March 2015

Geometric Structures And Representation Varieties (GEAR) May 2014

NSF Junior Retreat, University of Michigan (local organizing committee)

SERVICE:

MAA Basic Library List Committee

2018 - Present

Referee

Acta Arithmetica, Algebra & Number Theory, American Mathematical Monthly, Bulletin of the London Mathematical Society, Integers, International Journal of Number Theory, International Mathematics Research Notices, Journal of Number Theory, Journal of Pure and Applied Algebra, Journal of the Ramanujan Mathematical Society, Journal Théorie des Nombres Bordeaux, Manuscripta Mathematica, Mathematics Magazine, The Ramanujan Journal, Transactions of the American Mathematical Society

Mathematical Reviews
Reviewer, June 2011 - Present

Ph.D. defense committee member
Dianbin Bao, Temple University, 2017

GEAR Research Network member, "RNMS: Geometric Structures and Representation Varieties," supported by NSF Grants DMS-1107452, 1107263, 1107367.

PROFESSIONAL ORGANIZATIONS:

American Mathematical Society September 2007 - Present

Mathematical Association of America September 2012 - Present