Final Report
on the
Mathematical Sciences Research Institute
2016–17 Activities
supported by
NSA Grant H98230-16-1-0326
Support of Distinguished Researchers at MSRI
9/01/2016-8/31/2017

October 2017

Mathematical Sciences Research Institute
NSA Final Report for H98230-16-1-0326

I.   INTRODUCTION

The main scientific activities of MSRI are its Programs and Workshops. MSRI hosts two to four semester-long programs each year. Each program has about forty mathematicians in residence at any given time, including seven to eight graduate students.

Generally, each semester-long program features three workshops. A program begins with a *Connections for Women Workshop*, which is designed to encourage the participation of women in the research activities of the program. If the area of mathematics is one that traditionally has a large number of women, then the workshop can be used to highlight and to showcase their individual work. However, if the number of women in the field is low, then the workshop is marketed to a wider female audience in an effort to stimulate interest in the area. In addition, another goal is to encourage new connections among the women early in the program as a catalyst for eventual collaborations. This workshop is then followed by an *Introductory Workshop*, the purpose of which is to introduce the subject to the broader mathematical community. Later during the program, there is a *Topical Workshop*, which is designed to explore some of the themes of the program in greater depth.

In addition to the scientific workshops that run parallel with the programs, MSRI hosts a Hot Topics workshop. These workshops are intended to explore emerging topics in mathematics. (See Section II.B for a brief summary)

MSRI also hosts and co-hosts Education & Outreach Workshops. These workshops focus on improving the skills of K–12 math teachers. Their descriptions, as well as lists of speakers, talks and participants, can be found on the MSRI web site at http://www.msri.org/web/msri/education/for-k-12-educators.

Another essential activity at MSRI is its series of Summer Graduate Schools which target advanced graduate students in mathematics. During the summer of 2016, MSRI hosted four on-site and two off-site Summer Graduate Schools, with themes ranging from electronic structure theory topics to tropical curves. A complete description can be found at the URL http://www.msri.org/web/msri/scientific/workshops/summer-graduate-school.

Last but not least, each summer since 2007, MSRI has hosted a summer school (MSRI-UP) for undergraduate students with the aim of increasing the number of PhDs among members of under-represented groups. These summer schools are co-funded by the NSA and the NSF. The 2016 MSRI-UP, *Sandpile Groups*, was a successful and popular school, with 18 undergraduate participants. Since MSRI-UP is funded by an independent NSA grant, its report is filed separately. More information about MSRI-UP can be found on our website at http://www.msri.org/web/msri/education/for-undergraduates/msri-up.

II. OVERVIEW OF ACTIVITIES 2016–17

The year 2016–17 was an exciting one. In Fall 2016, we held a jumbo program: *Geometric Group Theory*, with lead organizer Mark Feighn (Rutgers). In Spring 2017, we held two programs: *Analytic Number Theory*, led by Terence Tao (UCLA), and *Harmonic Analysis*, led by Michael Christ (UC Berkeley) and Michael Lacey (Georgia Tech). MSRI also hosted a small Complementary Program for mathematicians whose interests were not closely related to the three programs. All programs are briefly summarized in Section II.A below.

There were 250 researchers who participated in these programs for a period of one month or longer. Of those members, there were 34 Postdoctoral Fellows, 50 Research Professors, 120 Research Members, and 46 Program Associates (Graduate Students).

The NSA grant H98230-16-1-0326 funded 19 researchers: six participated in the fall jumbo program, *Geometric Group Theory*, eleven participated in the spring programs, *Analytic Number Theory* and *Harmonic Analysis*, and two participated in the year-long Complementary Program.

A. Major Programs and their Associated Workshops

In the list of organizers of each activity, an asterisk (*) denotes lead organizer(s).

Program 1: Geometric Group Theory
August 15, 2016 - December 16, 2016
*Organizers: Ian Agol (University of California, Berkeley), Mladen Bestvina (University of Utah), Cornelia Drutu (University of Oxford), *Mark Feighn (Rutgers University), Michah Sageev (Technion---Israel Institute of Technology), Karen Vogtmann (University of Warwick)*

The field of geometric group theory emerged from Gromov's insight that even mathematical objects such as groups, which are defined completely in algebraic terms, can be profitably viewed as geometric objects and studied with geometric techniques Contemporary geometric group theory has broadened its scope considerably, but retains this basic philosophy of reformulating in geometric terms problems from diverse areas of mathematics and then solving them with a variety of tools. The growing list of areas where this general approach has been successful includes low-dimensional topology, the theory of manifolds, algebraic topology, complex dynamics, combinatorial group theory, algebra, logic, the study of various classical families of groups, Riemannian geometry and representation theory.

The goals of this MSRI program are to bring together people from the various branches of the field in order to consolidate recent progress, chart new directions, and train the next generation of geometric group theorists.

Workshops associated with the *Geometric Group Theory* program:

Workshop 1: Connections for Women: Geometric Group Theory
August 17, 2016 - August 19, 2016
*Organizers: *Ruth Charney (Brandeis University), Indira Chatterji (Université Nice Sophia-Antipolis), Mark Feighn (Rutgers University), Talia Fernós (University of North Carolina)*

This three-day workshop featured talks by six prominent female mathematicians on a wide range of topics in geometric group theory. Each speaker gave two lectures, separated by a break-out session during which participants met in small groups to discuss ideas presented in the first lecture. The workshop was open to all mathematicians.

Workshop 2: Introductory Workshop: Geometric Group Theory
August 22, 2016 - August 26, 2016
*Organizers: Martin Bridson (University of Oxford), Benson Farb (University of Chicago), *Zlil Sela (Hebrew University), Karen Vogtmann (University of Warwick)*

This was an introductory workshop to the MSRI jumbo program Geometric Group Theory held during the Fall Semester of 2016. The purpose of the workshop was to provide an overview of key areas of research to be covered in the program, including an introduction to open problems of current interest.

Workshop 3: Groups acting on CAT(0) spaces
September 27, 2016 - September 30, 2016
*Organizers: Ian Agol (University of California, Berkeley), Pierre-Emmanuel Caprace (Université Catholique de Louvain), Koji Fujiwara (Kyoto University), Alessandra Iozzi (ETH Zürich), * Michah Sageev (Technion---Israel Institute of Technology)*

The theme of the workshop was algebraic, geometric and analytical aspects of groups that act by isometries on spaces of non-positive curvature known as CAT(0) spaces. The world of CAT(0) spaces includes classical spaces such as symmetric spaces and buildings, as well as more avant-garde arrivals, such as CAT(0) cube complex. The workshop brought together researchers studying various aspects of such groups and spaces to discuss recent developments and chart new directions in the field.

Workshop 4: Geometry of mapping class groups and Out (Fn)
October 25, 2016 - October 28, 2016
*Organizers: Yael Algom-Kfir (University of Haifa), *Mladen Bestvina (University of Utah), Richard Canary (University of Michigan), Gilbert Levitt (Université de Caen)*

A four-day workshop with research-level talks on the latest advances in the geometry of mapping class groups and Out(F_n), and spaces on which they act.

Workshop 5: Amenability, coarse embeddability and fixed point properties
December 06, 2016 - December 09, 2016
Organizers: Goulnara Arzhantseva (University of Vienna), *Cornelia Drutu (University of Oxford), Graham Niblo (University of Southampton), Piotr Nowak (Polish Academy of Sciences)

The main theme of the workshop is the spectrum of analytic properties running from Kazhdan's property (T) at one end to von Neumann's amenability at the other, that forms a foundational organizing structure for infinite groups and spaces. These properties can be described both analytically, via unitary representation theory, and geometrically, using embedding properties for discrete spaces. Connections with probability and combinatorics was addressed during the meeting.

Program 2: Analytic Number Theory
January 17, 2017 - May 26, 2017
Organizers: Chantal David (Concordia University), Andrew Granville (Université de Montréal), Emmanuel Kowalski (ETH Zuerich), Philippe Michel (École Polytechnique Fédérale de Lausanne (EPFL)), Kannan Soundararajan (Stanford University), *Terence Tao (University of California, Los Angeles

Analytic number theory, and its applications and interactions, are currently experiencing intensive progress, in sometimes unexpected directions. In recent years, many important classical questions have seen spectacular advances based on new techniques; conversely, methods developed in analytic number theory have led to the solution of striking problems in other fields.

Recent advances in analytic number theory have had repercussions in various mathematical subjects, such as harmonic analysis (including the Langlands programme), ergodic theory and dynamics (especially on homogenous spaces), additive and multiplicative combinatorics and theoretical computer science (in particular, through the theory of expander graphs).

The MSRI semester program in Spring 2017 focused on the topic of Analytic Number Theory, with workshops and other activities focused on the most impressive recent achievements in this field. We wish not only to give the leading researchers in the area further opportunities to work together, but more importantly to give young people the occasion to learn about these topics, and to give them the tools to achieve the next breakthroughs.

Workshops associated with the *Analytic Number Theory* program:

Workshop 1: Connections for Women: Analytic Number Theory
February 02, 2017 - February 03, 2017
*Chantal David (Concordia University), Kaisa Matomäki (University of Turku), Lillian Pierce (Duke University), Kannan Soundararajan (Stanford University), Terence Tao (University of California, Los Angeles)

This workshop consisted of lectures on the current state of research in analytic number theory, given by prominent women and men in the field. The workshop was opened to all graduate students, post-docs, and researchers in areas related to the program; it also included a panel discussion session among female researchers on career issues, as well as other social events.

Workshop 2: Introductory Workshop: Analytic Number Theory
February 06, 2017 - February 10, 2017
*Andrew Granville (Université de Montréal), *Emmanuel Kowalski (ETH Zuerich), Kaisa Matomäki (University of Turku), Philippe Michel (École Polytechnique Fédérale de Lausanne (EPFL))*

There were three minicourses, each three hours long: (1) K. Matomäki and M. Radziwill on multiplicative functions (2) Ph. Michel on trace functions and their applications (3) I. Petrow on Kuznetsov formula, Kloostermania and applications All other talks were one-hour long and targeted to a wide audience. In particular, speakers attempted to give lectures that are also accessible to the participants of the Harmonic Analysis Program.

Workshop 3: Recent developments in Analytic Number Theory
May 01, 2017 - May 05, 2017
*Tim Browning (University of Bristol), Chantal David (Concordia University), Kannan Soundararajan (Stanford University), *Terence Tao (University of California, Los Angeles)*

This workshop focused on presenting the latest developments in analytic number theory, including (but not restricted to) recent advances in sieve theory, multiplicative number theory, exponential sums, arithmetic statistics, estimates on automorphic forms, and the Hardy-Littlewood circle method.

<u>Program 3: Harmonic Analysis</u>
January 17, 2017 to May 26, 2017
**Michael Christ (University of California, Berkeley), Allan Greenleaf (University of Rochester), Steven Hofmann (University of Missouri), *Michael Lacey (Georgia Institute of Technology), Svitlana Mayboroda (University of Minnesota, Twin Cities), Betsy Stovall (University of Wisconsin-Madison), Brian Street (University of Wisconsin-Madison)*

The field of Harmonic Analysis dates back to the 19th century, and has its roots in the study of the decomposition of functions using Fourier series and the Fourier transform. In recent decades, the subject has undergone a rapid diversification and expansion, though the decomposition of functions and operators into simpler parts remains a central tool and theme.

This program brought together researchers representing the breadth of modern Harmonic Analysis and seek to capitalize on and continue recent progress in four major directions:

-Restriction, Kakeya, and Geometric Incidence Problems

-Analysis on Nonhomogeneous Spaces

-Weighted Norm Inequalities

-Quantitative Rectifiability and Elliptic PDE

Many of these areas draw techniques from or have applications to other fields of mathematics, such as analytic number theory, partial differential equations, combinatorics, and geometric measure theory.

Workshop 1: Connections for Women: Harmonic Analysis
January 19, 2017 - January 20, 2017
*Svitlana Mayboroda (University of Minnesota, Twin Cities), *Betsy Stovall (University of Wisconsin-Madison)*

This workshop highlighted the work of several prominent women working in harmonic analysis, including some of the field's rising stars. There was a panel discussion and a contributed poster session. This workshop was open to all, and poster contributions were welcomed from all mathematicians.

Workshop 2: Introductory Workshop: Harmonic Analysis
January 23, 2017 - January 27, 2017
*Allan Greenleaf (University of Rochester), *Michael Lacey (Georgia Institute of Technology), Svitlana Mayboroda (University of Minnesota, Twin Cities), Betsy Stovall (University of Wisconsin-Madison), Brian Street (University of Wisconsin-Madison)*

This week-long workshop served as an introduction for graduate students, postdocs, and other researchers to the main themes of the program. It featured accessible talks by a number of leading harmonic analysts, including several short courses on the core ideas and techniques in the field. There was a problem session, to which all participants were encouraged to contribute.

Workshop 3: Recent Developments in Harmonic Analysis
May 15, 2017 - May 19, 2017
*Michael Christ (University of California, Berkeley), Steven Hofmann (University of Missouri), *Michael Lacey (Georgia Institute of Technology), Betsy Stovall (University of Wisconsin-Madison), Brian Street (University of Wisconsin-Madison)*

Topics for this workshop was drawn from the main research directions of this conference, including:
(1) Restriction, Kakeya, and geometric incidence problems
(2) Analysis on nonhomogenous spaces
(3) Weighted estimates
(4) Quantitative rectifiability and other topics in PDE

Program 4: Complementary Program (2016-17)
The Complementary Program had a limited number of memberships that were open to mathematicians whose interests were not closely related to the core programs; special consideration was given to mathematicians who were partners of an invited member of a core program.

B. Hot Topics Workshop

Hot Topics: Galois Theory of Periods and Applications
March 27, 2017 - March 31, 2017
*Organizers: *Francis Brown (University of Oxford), Clément Dupont (Université de Montpellier), Richard Hain (Duke University), Vadim Vologodsky (University of Oregon)*

Periods are integrals of algebraic differential forms over algebraically-defined domains and are ubiquitous in mathematics and physics. A deep idea, originating with Grothendieck, is that there should be a Galois theory of periods. This general principle provides a unifying approach to several problems in the theory of motives, quantum groups and geometric group theory. This conference brought together leading experts around this subject and cover topics such as the theory of multiple zeta values, modular forms, and motivic fundamental groups.

III. PARTICIPATION SUMMARY
A. All MSRI Members

The table below indicates the number of participants for the major programs and workshops that took place at MSRI during the 2016–17 academic year.

Time	Activity Type	Activity Title	No. of participants
Fall 2016	Scientific Program	Geometric Group Theory	107
August 17, 2016 - August 19, 2016	Programmatic Workshop	Connections for Women: Geometric Group Theory	92
August 22, 2016 - August 26, 2016	Programmatic Workshop	Introductory Workshop: Geometric Group Theory	148
September 27, 2016 – September 30, 2016	Programmatic Workshop	Groups acting on CAT(0) spaces	140
October 25, 2016 – October 28, 2016	Programmatic Workshop	Geometry of mapping class groups and Out(Fn)	145
December 06, 2016 – December 09, 2016	Programmatic Workshop	Amenability, coarse embeddability and fixed point properties	95

Spring 2017	Scientific Program	Analytic Number Theory	57
February 02, 2017 – February 03, 2017	Programmatic Workshop	Connections for Women: Analytic Number Theory	70
February 06, 2017 – February 10, 2017	Programmatic Workshop	Introductory Workshop: Analytic Number Theory	138
May 01, 2017 – May 05, 2017	Programmatic Workshop	Recent developments in Analytic Number Theory	138
Spring 2017	Scientific Program	Harmonic Analysis	73
January 19, 2017 - January 20, 2017	Programmatic Workshop	Connections for Women: Harmonic Analysis	65
January 23, 2017 – January 27, 2017	Programmatic Workshop	Introductory Workshop: Harmonic Analysis	124
May 15, 2017 – May 19, 2017	Programmatic Workshop	Recent Developments in Harmonic Analysis	106
Academic Year 2016-17	Scientific Program	Complementary Program 2016-17	13
June 11, 2016 – July 24, 2016	MSRI-UP 2016	Sandpile Groups	18
May 30, 2016 - June 11, 2016	Summer Graduate School (2016)	Séminaire de Mathématiques Supérieures 2016: Dynamics of Biological Systems	25
June 13, 2016 - July 24, 2016	Summer Graduate School (2016)	Harmonic Analysis and Elliptic Equations on real Euclidean Spaces and on Rough Sets	51
June 20, 2016 – July 01, 2016	Summer Graduate School (2016)	Mixed Integer Nonlinear Programming: Theory, algorithms and applications	11
July 11, 2016 - July 22, 2016	Summer Graduate School (2016)	An Introduction to Character Theory and the McKay Conjecture	41
July 18, 2016 - July 29, 2016	Summer Graduate School (2016)	Electronic Structure Theory	39
July 25, 2016 - August 05, 2016	Summer Graduate School (2016)	Chip Firing and Tropical Curves	50
March 27, 2017 – March 31, 2017	Other Scientific Workshop	Hot Topics: Galois Theory of Periods and Applications	75

B. NSA supported researchers

There were 250 long-term members who participated in the 2016–17 programs. The NSA grant, H98230-16-1-0326, funded 19 out of the 250 researchers. Since the provisional Indirect Cost rate decreased from the proposed 24.38% to 20.17%, we were able to fund additional researchers in their monthly lodging reimbursement and travel expenses. Detailed financial information can be found in Section V.

Here are additional details on the researchers for each program:

GEOMETRIC GROUP THEORY

**Brock,
Jeffery**
Research
Member

Name: Jeffery Brock
Year of Ph.D: 1997
Institution of Ph.D.: UC Berkeley

Current Position:
Professor, Brown University, 2007-present.

Award, Honors, and Distinctions:
1) Elected Fellow, American Mathematical Society, 2017.
2) John Simon Guggenheim Fellow, 2008.
3) Donald D. Harrington Faculty Fellow, University of Texas at Austin 2003-2004.
4) NSF Postdoctoral Fellow, Stanford University, 1997-2000.

Publications:
1) Erratum to "On the density of geometrically finite Kleinian groups." (With Ken Bromberg). Preprint (2017)..
2) Local topology in deformation spaces of hyperbolic 3-manifolds II. (arXiv). (With Ken Bromberg, Richard Canary, Cyril Lecuire, and Yair Minsky). Preprint (2017).
3) Schwarzian derivatives, projective structures, and the Weil-Petersson gradient flow for renormalized volume. (arXiv). (With Martin Bridgeman and Ken Bromberg). Preprint (2017).
4) Machine learning algorithm for automatic detection of CT-identifiable hyperdense lesions associated with traumatic brain injury. Krishna N. Keshavamurthy ; Owen P. Leary ; Lisa H. Merck ; Benjamin Kimia ; Scott Collins ; David W. Wright ; Jason W. Allen ; Jeffrey F. Brock ; Derek Merck. Proc. SPIE 10134, Medical Imaging 2017: Computer-Aided Diagnosis, 101342G (March 23, 2017); doi:10.1117/12.2254227.
5) Limit sets of Weil-Petersson geodesics. (arXiv). (With Christopher Leininger, Babak Modami, and Kasra Rafi). Preprint (2017).
6) Windows, cores, and skinning maps. (arXiv). (With Ken Bromberg, Dick Canary, and Yair Minsky). Preprint (2016).
7) Limit sets of Teichmüller geodesics with minimal nonuniquely ergodic vertical foliation, II. (arXiv). (With Chris Leininger, Babak Modami, and Kasra Rafi). Crelle's Journal, DOI: https://doi.org/10.1515/crelle-2017-0024.
8) Norms on the cohomology of hyperbolic 3-manifolds. (arXiv). (With Nathan Dunfield). Inventiones Mathematicae, pp. 1-28. DOI: 10.1007/s00222-017-0735-3.
9) Geometric inflexibility of hyperbolic cone-manifolds. (arXiv). (With Ken Bromberg). To appear, Proceedings of the 2014 MSJ-SI.
10) Inflexibility, Weil-Petersson distance, and volumes of fibered 3-manifolds. (arXiv). (With Ken Bromberg). Math. Res. Lett. 23 (2016) pp. 649-674.

Dani, Pallavi
Research
Member

Name: Pallavi Dani
Year of Ph.D: 2005
Institution of Ph.D.: University of Chicago

Current Position:
Associate Professor, Louisiana State University, 2014-present.

Award, Honors, and Distinctions:
1) 2009-2010 Government of India, Conference Grant administered through Goa University, India, Co-PI.
2) 2010-2012 National Science Foundation, Conference Grant, Co-PI, DMS 1004774.
3) 2011-2016 Simons Foundation, Collaboration Grant, Awarded but declined by PI due to conflict with Louisiana Board of Regents Grant below.
4) 2012-2015 National Science Foundation, DMS 1207868.

Publications:
1) P. Dani, The asymptotic density of finite-order elements in virtually nilpotent groups, J. Algebra 316 (2007), no. 1, 54–78.
2) J. Barnard, N. Brady, and P. Dani, Super-exponential distortion of subgroups of CAT(−1) groups, Algebr. Geom. Topol. 7 (2007), 301–308.
3) N. Brady, M. Clay, and P. Dani, Morse theory and conjugacy classes of finite subgroups, Geom. Dedicata 135 (2008), 15–22.
4) N. Brady, M. Clay, and P. Dani, Morse theory and conjugacy classes of finite subgroups II, Geom. Dedicata 147 (2010), 1–14.
5) J. Barnard, N. Brady, and P. Dani, Super-exponential 2-dimensional Dehn functions, Groups Geom. Dyn. 6 (2012), no. 1, 1–51.
6) A. Abrams, N. Brady, P. Dani, M. Duchin, and R. Young, Filling loops at infinity in the mapping class group, Michigan Math. J. 61 (2012), no. 4, 867–874.
7) A. Abrams, N. Brady, P. Dani, M. Duchin, and R. Young, Pushing fillings in right-angled Artin groups, J. Lond. Math. Soc. (2) 87 (2013), no. 3, 663–688.
8) A. Abrams, N. Brady, P. Dani, and R. Young, Homological and homotopical Dehn functions are different, Proc. Natl. Acad. Sci. USA 110 (2013), no. 48, 19206–19212.
9) P. Dani and A. Thomas, Divergence in right-angled Coxeter groups, Trans. Amer. Math. Soc. 367 (2015), no. 5, 3549–3577.
10) P. Dani and A. Thomas, Quasi-isometry classification of certain right-angled Coxeter groups, arXiv:1402.6224.

Feighn, Mark
Organizer

Name: Mark Feighn
Year of Ph.D: 1981
Institution of Ph.D.: Columbia University

Current Position:
Professor, Rutgers University: Rutgers-Newark, 2014-present.

Award, Honors, and Distinctions:
1) 2009-2010 Government of India, Conference Grant administered through Goa University, India, Co-PI.
2) 2010-2012 National Science Foundation, Conference Grant, Co-PI, DMS 1004774.
3) 2011-2016 Simons Foundation, Collaboration Grant, Awarded but declined by PI due to conflict with Louisiana Board of Regents Grant below.
4) 2012-2015 National Science Foundation, DMS 1207868.

Publications:
1) *Actions of finite groups on homotopy 3-spheres*, TAMS 284(1984), no. 1, 141--151.
2) *Branched covers according to J.W. Alexander*, Collectanea Math. 37(1986), 55--60.
3) with Darryl McCullough, *Finiteness conditions for 3-manifolds with boundary*, Amer. J. of Math. 109(1987), 1155--1169. Correction to: Finiteness conditions for 3-manifolds with boundary, Amer. J. Math. 112(1990), 41--45.
4) *Separation properties of codimension-1 immersions*, Topology 27(1988), no. 3, 319--321.
5) with Mladen Bestvina, *A counterexample to generalized accessibility*, in Arboreal Group Theory (R.C. Alperin, ed.), MSRI Publ., vol. 19, Springer-Verlag, 1991, 133--141.
6) with Geoffrey Mess, *Conjugacy classes of finite subgroups of Kleinian groups*, Amer. J. Math. 113(1991), 179--188.
7) with Mladen Bestvina, *Outer Limits*, preprint, 1994, 19 pages.
8) with Mladen Bestvina, *Stable actions on real trees*, Inventiones 121(1995), 287--321.

**Leininger,
Christopher**
Research
Member

Name: Christopher Leininger
Year of Ph.D: 2002
Institution of Ph.D.: The University of Texas

Current Position:
Associate Professor, University of Illinois: Urbana-Champaign, 2010-present.

Award, Honors, and Distinctions:
1) 2006-2015 N.S.F. Grants D.M.S.-060388,0905748, and 1207184
2) Lois M. Lackner Scholar, Dept. of Math., UIUC, 2011–2013.
3) Campus Research Board, UIUC, Summer 2010, spring 2007, Fall 2005.
4) Helen Corley Petit Scholar, College of LAS, UIUC, 2010–2011.
5) Center for Advanced Study Fellowship, UIUC, Fall 2007.

Publications:
1) (w/ G. Lakeland) *Systoles and Dehn surgery for hyperbolic 3–manifolds*, preprint.
2) (w/ S. Dowdall and I. Kapovich) *Dynamics on free-by-cyclic groups*, preprint.
3) (w/ V. Gadre, E. Hironaka, and R.P. Kent IV) *Lipschitz constants to curve complexes*, to appear Math. Res. Lett..
4) (w/ R.P. Kent IV and S. Dowdall) *Pseudo-Anosov subgroups of fibered 3-manifold groups*, to appear Groups Geom. Dyn.
5) (w/ R.P. Kent IV) *A geometric criterion to be pseudo-Anosov*, preprint.
6) (w/ J. Aramayona) *Finite rigid sets in curve complexes*, to appear in Journal of Topology and Analysis.
7) (w/ D. Margalit) *On the number and location of short geodesics in moduli space*, to appear in Journal of Topology.
8) (w/ S. Schleimer) *Hyperbolic spaces in Teichm¨uller spaces*, to appear in JEMS.
9) (w/ M. Clay and J. Mangahas) *The geometry of right angled Artin subgroups of mapping class groups*, Groups Geom. Dyn. 6 (2012), no. 2, 249278
10) (w/ B. Farb and D. Margalit) Small dilatation pseudo-Anosov homeomorphisms and 3-manifolds, Adv. Math. 228 (2011), no. 3, 14661502.

Minsky, Yair
Research
Member

Name: Christopher Leininger
Year of Ph.D: 1989
Institution of Ph.D.: Princeton University

Current Position:
Professor, Yale University, 2003-present.

Award, Honors, and Distinctions:
1) NSF Research Grant DMS-1610827, 2016–2019
2) NSF Research Grant DMS-1311844, 2013–2016
3) Departmental Chair Fall 2010 to Fall 2014
4) Director of Undergraduate Studies, 2007–2009

Publications:
1) *Harmonic maps, length and energy in Teichm¨uller space*, J. Differential Geom. 35 (1992), 151–217.
2) *Harmonic maps into hyperbolic 3-manifolds*, Trans. Amer. Math. Soc. 332 (1992), 607–632.
3) *Teichm¨uller geodesics and ends of hyperbolic 3-manifolds*, Topology 32 (1993), 625–647.
4) *On rigidity, limit sets and end invariants of hyperbolic 3-manifolds*, J. Amer. Math. Soc. 7 (1994), 539–588.
5) *On Thurston's ending lamination conjecture*, Proceedings of Low-Dimensional Topology, May 18-23, 1992, International Press, 1994.
6) *Quasi-projections in Teichm¨uller space*, J. Reine Angew. Math. 473 (1996), 121–136.
7) *Extremal length estimates and product regions in Teichm¨uller space*, Duke Math J. 83 (1996), 249–286.
8) *A geometric approach to the complex of curves*, Proceedings of the 37th Taniguchi Symposium on Topology and Teichm¨uller Spaces (S. Kojima et. al., ed.), World Scientific, 1996, pp. 149–158.
9) With R. Canary, *On limits of tame hyperbolic 3-manifolds*, J. Differential Geom. 43 (1996), 1–41.
10) With M. Lyubich, *Laminations in holomorphic dynamics*, J. Differential Geom. 47 (1997), 17–94.

**Vogtmann,
Karen**
Organizer

Name: Karen Vogtmann
Year of Ph.D: 1977
Institution of Ph.D.: University of California, Berkeley

Current Position:
Professor, University of Warwick, 2013-present.
Goldwin Smith Professor of Mathematics Emeritus, Cornell University, 2015-present.

Award, Honors, and Distinctions:
1) Simons Professor, Newton Institute, Spring 2017
2) Simons Professor, M.S.R.I. Fall 2016
3) Clay Senior Scholar award, 2016
4) Scientific Advisory Board, Berlin Mathematical School, 2015 -present
5) Conseil Scientifique Extérieur, MILYON 2012-present

Publications:
1) *Homology Stability for On,n*, Comm. Alg., 7 (1979), no.1., 9-38.
2) *Spherical Posets and homology stability for On,n*, Topology 20 (1981), 119-132.
3) *A Stieffel complex for the orthogonal group of a field*, Comment. Math. Helv. 57 (1982), no.1, 11-21.
4) *The integral homology of SL2 and PSL2 over Euclidean imaginary quadratic integers*, (with J. Schwermer) Comment. Math. Helv. 58 (1983) no.4, 573-598.
5) *Rational homology of Bianchi groups*, Math. Ann. 272 (1985), 399-419.
6) *Moduli of graphs and automorphisms of free groups*, (with M. Culler) Inventionnes 84 (1986), 91-119.
7) *A generating function for the Euler characteristic of Out(Fn)*, (with J. Smillie) J. Pure and Appl. Algebra 44 (1987), 329-348.
8) *Automorphisms of graphs, p-subgroups of Out(Fn) and the Euler characteristic of Out(Fn)*, (with J. Smillie) J. Pure and Appl. Algebra 49 (1987), 187-200.
9) *Local structure of some Out(Fn)-complexes*, Proc. Edinburgh Math Soc. 33 (1990), 367-379.
10) *The boundary of outer space in rank two*, (with M. Culler) in Arboreal Group Theory (R. Alperin, ed) New York: Springer-Verlag (1991) 189-229.

ANALYTIC NUMBER THEORY

Name: Kevin Ford
Year of Ph.D: 1994
Institution of Ph.D.: University of Illinois at Urbana-Champaign

Current Position:
Professor, University of Illinois at Urbana-Champaign, 2001-present

Award, Honors, and Distinctions:
1) National Science Foundation Grant DMS-1501982; 2015-18
2) NSF. Two grants for the conference: Number Theory at Illinois, 2014
3) Fellow of the American Mathematical Society, 2013
4) Board of Directors, Number Theory Foundation, 2009-present

Publications:
1) K. Ford, *Some infinite series identities*, Proc. Amer. Math. Soc. 119 no. 3 (1993), 1019–1020.
2) K. Ford, *The representation of numbers as sums of unlike powers*, J. London Math. Soc. (2) 51 (1995), 14–26.
3) K. Ford, *The representation of numbers as sums of unlike powers, II*, J. Amer. Math. Soc. 9 (1996), 919–940. Addendum and Corrigendum, J. Amer. Math. Soc. 12 (1999), 1213.
4) K. Ford, *New estimates for mean values of Weyl sums*, Intern. Math. Res. Notices 1995, 155–171.
5) K. Ford, *Sums and products from a finite set of real numbers*, Ramanujan J. 2, no. 1–2 (1998), 59–66.
6) K. Ford, *The distribution of totients*, Paul Erd˝os (1913–1996), Ramanujan J. 2, no. 1–2 (1998), 67–151.
7) K. Ford, S. Konyagin and C. Pomerance, *Residue classes free of values of Euler's function*, Number Theory in Progress, Vol. 2 (Zakopane, Poland, July 1997), Walter de Gruyter, Berlin, 1999, 805–812.
8) K. Ford, *The normal behavior of the Smarandache function*, Smarandache Notions J. 10, no. 1-2-3. (1999), 81–86.
9) K. Ford and H. Halberstam, *The Brun-Hooley sieve*, J. Number Theory 81 (2000), 335–350.
10) K. Ford, *Waring's problem with polynomial summands*, J. London Math. Soc. (2) 61 (2000), 671–680.

Marshall, Simon
Research
Member

Name: Simon Marshall
Year of Ph.D: 2010
Institution of Ph.D.: Princeton University

Current Position:
Assistant Professor, University of Wisconsin–Madison, 2014-present

Award, Honors, and Distinctions:
1) NSF Grant DMS-1501230, July 2015–June 2018
2) NSF Grant DMS-1509331, August 2014–June 2016.
3) NSF Grant DMS-1201321, July 2012–December 2014.
4) Princeton University Centennial Fellowship.
5) International Mathematics Olympiad silver and gold medals, 2001 and 2002.

Publications:
1) *Endpoint restriction theorems for group orbits* (with A. Seeger), 14 pages, in preparation.
2) *Sup norms of Maass forms on semisimple groups*, 33 pages, preprint.
3) *Local bounds for Lp norms of Maass forms in the level aspect*, 7 pages, submitted.
4) *Geodesic restrictions of arithmetic eigenfunctions*, 38 pages, to appear in Duke Math. J.
5) *Endoscopy and cohomology of a quasi-split U*(4), 21 pages, to appear in the proceedings of the Simons Symposium 'Families of Automorphic Forms and the Trace Formula'.
6) *Endoscopy and cohomology growth on U*(3), Compositio Math. 150 (2014), 903-910. Available on CJO2014 doi: 10.1112/S0010437X13007720.
7) *On the torsion in the cohomology of arithmetic hyperbolic 3-manifolds* (with W. Müller), Duke Math. J. 162 no. 5 (2013), 863-888.
8) *Theta lifting and cohomology growth in p-adic towers* (with M. Cossutta), IMRN 2013 no. 11 (2013), 2601-2623, doi: 10.1093/imrn/rns139.
9) *Zero repulsion in families of elliptic curve L-functions and an observation of S. J. Miller*, BLMS 45 no. 1 (2013), 80-88, doi: 10.1112/blms/bds063.

**Ramakrishnan,
Dinakar**
Research
Professor

Name: Dinakar Ramakrishnan
Year of Ph.D: 1980
Institution of Ph.D.: Columbia University

Current Position:
Taussky-Todd-Lonergan Professor of Mathematics, California Institute of Technology, 1988-present

Award, Honors, and Distinctions:
1) The Johns Hopkins Society of Fellows
2) Fellows of the American Mathematical Society
3) Alfred P. Sloan Fellowship
4) AMS post-doctoral Fellowship

Publications:
1) (with M. Dimitrov) Arithmetic Quotients of the Complex Ball and a conjecture of Lang, to appear (2015), 1–21; recommended for publication by the editor and referee, awaiting the final word.
2) A theorem on GL(n) `a l`a Tchebotarev, preprint (2014) being revised to incorporate the referee's comments, to appear (2016). (This article strengthens considerably the earlier paper (c) below)
3) (with D. Prasad) Selfdual representations of division algebras and Weil groups: A contrast, with an appendix by D. Jiang and D. Soudry, American Journal of Math. 134, no. 3, 729–742 (2012).
4) (with K. Paranjape) Modular forms and Calabi-Yau varieties, Arithmetic and Geometry, London Mathematical Society Lecture Notes Series 420, edited by Luis Dieulefait, D.R. Heath-Brown, Gerd Faltings, Yuri I. Manin, B.Z. Moroz and Jean-Pierre Wintenberger, Cambridge University Press, 351–372 (2015).
5) (with P. Michel) Consequences of the Gross-Zagier formulae: Stability of average L-values, Subconvexity, and Non-vanishing mod p, Number theory, analysis and geometry (In memory of Serge Lang), 437-459, Springer, NY (2012).

**Soundararajan,
Kannan**
Organizer

Name: Kanna Soundararajan
Year of Ph.D: 1998
Institution of Ph.D.: Princeton University

Current Position:
Professor, Stanford University, 2006-present

Award, Honors, and Distinctions:
1) 2003 Salem Price "for contributions to the area of Dirichlet L-functions and related character sums"
2) 2005 won the SASTRA Ramanujan Prize shared with Manjul Bhargava
3) 2011 awarded the Infosys science foundation prize
4) 2011 Ostrowski prize, shared with Ib Madsen and David Preiss

Publications:
1) The distribution of consecutive prime biases and sums of sawtooth random variables. Robert J. Lemke Oliver, Kannan Soundararajan
2) Fourier optimization and prime gaps. Emanuel Carneiro, Micah B. Milinovich, Kannan Soundararajan
3) A more intuitive proof of a sharp version of Halász's theorem. Andrew Granville, Adam J Harper, K. Soundararajan
4) A new proof of Halász's Theorem, and its consequences. Andrew Granville, Adam J Harper, K. Soundararajan
5) Restriction of Hecke eigenforms to horocycles. Ho Chung Siu, Kannan Soundararajan
6) Non-zero coefficients of half-integral weight modular forms mod ℓ. Joël Bellaïche, Ben Green, Kannan Soundararajan
7) Maximum of the Riemann zeta function on a short interval of the critical line. Louis-Pierre Arguin, David Belius, Paul Bourgade, Maksym Radziwiłł, Kannan Soundararajan
8) The variance of divisor sums in arithmetic progressions. Brad Rodgers, Kannan Soundararajan
9) The Liouville function in short intervals [after Matomaki and Radziwill]. Kannan Soundararajan
10) Unexpected biases in the distribution of consecutive primes. Robert J. Lemke Oliver, Kannan Soundararajan

Thompson, Lauren
Research Member

Name: Lauren (Lola) Thompson
Year of Ph.D: 2012
Institution of Ph.D.: Dartmouth College

Current Position:
Assistant Professor, Oberlin College, 2013-present

Award, Honors, and Distinctions:
1) Mathematical Sciences Research Institute Fellowship, 2017
2) Max Planck Institute for Mathematics Research Fellowship, 2016.
3) MAA Project NExT Leitzel Fellowship, 2013 - 2014.
4) MAA Ohio Committee on Section Activities. Committee Member, Fall 2013 - Present.

Publications:
1) Divisor-sum fibers. To appear in Mathematika. Available online: arXiv:1706.03120 [math.NT] Joint with Paul Pollack and Carl Pomerance
2) Bounded gaps between primes and the length spectra of arithmetic hyperbolic 3-orbifolds. To appear in Comptes Rendus Mathematique. Available online: arXiv:1705.08034 [math.GT] Joint with Benjamin Linowitz, D. B. McReynolds, and Paul Pollack.
3) Lower bounds for heights in relative Galois extensions. To appear in the Women In Numbers Europe 2 conference proceedings. Available online: arXiv:1704.02995 [math.NT] Joint with Kevser Akta¸s, Shabnam Akhtari, Kirsti Biggs, Alia Hamieh, and Kathleen Petersen.
4) A generalization of the practical numbers. To appear in the International Journal of Number Theory. Available online: arXiv:1701.08504 [math.NT] Joint with Nicholas Schwab.
5) The Fourier coefficients of Eisenstein series newforms. Submitted for publication. Joint with Benjamin Linowitz.
6) Systoles of arithmetic hyperbolic surfaces and 3-manifolds. To appear in Mathematical Research Letters. Available online: arXiv: 1504.05257 [math.GT] Joint with Benjamin Linowitz, D. B. McReynolds, Paul Pollack.
7) Counting and effective rigidity in algebra and geometry. Submitted for publication. Available online: arXiv:1407.2294 [math.GT]. Joint with Benjamin Linowitz, D. B. McReynolds, Paul Pollack.
8) Arithmetic functions at consecutive shifted primes. International Journal of Number Theory 11, no. 5 (2015), p. 1477-1498. Joint with Paul Pollack.

HARMONIC ANALYSIS

Name: Michael Lacey
Year of Ph.D: 1987
Institution of Ph.D.: University of Illinios, Urbana-Champaign

Lacey, Michael
Organizer

Current Position:
Full Professor, Georgia Institute of Technology, 2001-present

Award, Honors, and Distinctions:
  1) 2013 American Mathematical Society Fellow
  2) 2012 Simons Fellow
  3) 2012 Georigia Tech NSF-ADVANCE Mentoring Award
  4) 2008 Fulbright Fellowship, Buenos Aires, Argentina

Publications:
  1) Ben Krause and Michael T. Lacey, A Discrete Quadratic Carleson Theorem on ℓ^2 with a Restricted Supremum (2015), available at http://arxiv.org/abs/1512.06918.
  2) Dmitriy Bilyk and Michael T. Lacey, Random Tessellations, Restricted Isometric Embeddings, and One Bit Sensing (2015), available at http://arxiv.org/abs/1512.06697.
  3) Irina Holmes, Michael T. Lacey, and Bret D. Wick, Commutators in the Two-Weight Setting, Math. Annallen, to appear, available at http://arxiv.org/abs/1506.05747.
  4) Carlos Domingo-Salazar, Michael T. Lacey, and Guillermo Rey, Borderline Weak Type Estimates for Singular Integrals and Square Functions, Bull London Math Soc., DOI 10.1112/blms/bdv090.
  5) Michael T. Lacey and Scott Spencer, On entropy bumps for Calderón-Zygmund operators, Concr. Oper. 2(2015), 47–52.
  6) Michael T. Lacey, An elementary proof of the A2 Bound, Israel J. Math., to appear (2015).
  7) Michael T. Lacey and Brett Wick, Two Weight Inequalities for Riesz Transforms: Uniformly Full Dimension Weights (2013), available at http://arxiv.org/abs/1312.6163.
  8) Michael T. Lacey and Kangwei Li, Two weight norm inequalities for the g function, Math. Res. Lett. 21 (2014), no. 3, 521–536.

Lanzani, Loredana
Research Member

Name: Loredana Lanzani
Year of Ph.D: 1997
Institution of Ph.D.: Purdue University

Current Position:
Professor, Syracuse University, 2014-present

Award, Honors, and Distinctions:
1) PI, National Science Foundation Individual Research Award (DMS-1001304) 2010 – 2015
2) PI, National Science Foundation Individual Research Award (DMS-0700815) 2007 – 2010
3) AWM Research Symposium showcase lecture – section in Harmonic Analysis 2013

Publications:
1) Lanzani L., Myers J. and Raich S. A., *Taylor Series of Conformal Mappings onto Symmetric Quadrilaterals*, Cplx. Vbls & Ellipt. Eqns., to appear.
2) Lanzani L. and Stein E. M., *The Cauchy Integral in Cn for domains with minimal smoothness*, Adv. Math. 264 (2014) 776 – 830.
3) Lanzani L. and Stein E. M., *Cauchy-type integrals in several complex variables*, Bull. Math. Sci. 3 (2) (2013), 241-285. DOI: 10.1007/s13373-013-0038-y
4) Lanzani L. *Higher Order analogues of the exterior derivative complex*, Bull. IMAS (New Series) 8 (3) (2013) 389 – 398.
5) Lanzani L. and Raich A. S. *On Div-Curl for higher order*, Advances in Analysis: the Legacy of E. M. Stein, Princeton U. Press (2013), ISBN: 9780691159416.
6) Lanzani L. and Stein E. M. *The Bergman projection in Lp for domains with minimal smoothness*, Illinois J. of Math. (invited submission) 56 (1) (2013) 127 – 154.
7) Barrett, D. E. and Lanzani L., *The Leray transform on weighted boundary spaces for convex Reinhardt domains*, J. Funct. Analysis 257 (9) (2009), 2780-2819.
8) Koenig, K. and Lanzani, L. *Bergman vs. Szeg˝o via Conformal Mapping*, Indiana Univ. Math. J. 58, no. 2 (2009), 969-997.
9) Brown, R., Capogna, L. and Lanzani, L. *On the Mixed Boundary Value Problem for Laplace's Operator on Lipschitz Planar Domains*, Math. Annalen, 342 (2008), 91-124.
10) Lanzani, L. and Mendez, O. *The Poisson Problem for the Laplacian with Robin Boundary Condition in Non-Smooth Domains*. Revista Mat. Iberoamer. 22 (2006) 181-204.

Mayboroda, Svitlana
Organizer

Name: Svitlana Mayboroda
Year of Ph.D: 2005
Institution of Ph.D.: University of Missouri at Columbia

Current Position:
Northrop Professor, University of Minnesota, 2016-present
Full Professor, University of Minnesota, 2015-present

Award, Honors, and Distinctions:
1) Von Neumann Fellowship, IAS, 2018
2) Simons Foundation, Simons Fellowship in Mathematical Sciences, PI, 2017–2018
3) Ecole Polytechnique, 2016, chercheur invité, 3 months
4) NSF, The Nineteenth Rivière-Fabes Symposium, PI, 2016
5) 2015 Fellow of the American Mathematical Society
6) Alfred P. Sloan Research Fellowship, 2010–2015

Publications:
1) *One single static measurement predicts wave localization in complex structures* (with Gautier Lefebvre, Alexane Gondel, Marc Dubois, Michael Atlan, Florian Feppon, Aimé Labbé, Camille Gillot, Alix Garelli, Maxence Ernoult, Marcel Filoche, Patrick Sebbah), Physical Review Letters, accepted.
2) *Uniform Rectifiability, Carleson measure estimates, and approximation of harmonic functions,* (with Steve Hofmann and Jose Maria Martell), Duke Math. J., accepted.
3) *Rectifiability of harmonic measure* (with Jonas Azzam, Steve Hofmann, José María Martell, Mihalis Mourgoglou, Xavier Tolsa, and Alexander Volberg), Geometric and Functional Analysis (GAFA), accepted DOI: 10.1007/s00039-016-0371-x
4) *The effective confining potential of quantum states in disordered media* (with Doug Arnold, Guy David, Marcel Filoche, and David Jerison), Physical Review Letters, 116 (2016), 056602.
5) *Square function/non-tangential maximal function estimates and the Dirichlet problem for non-symmetric elliptic operators* (with Steve Hofmann, Carlos Kenig, and Jill Pipher), Journal of the American Mathematical Society, 28 (2015), no. 2, 483–529.
6) *Boundedness of the gradient of a solution and Wiener test of order one for the biharmonic equation* (with Vladimir Maz'ya), Inventiones Mathematicae, 175 (2009), no. 2, 287–334.
7) *Universal mechanism for Anderson and weak localization* (with Marcel Filoche), Proceedings of the National Academy of Sciences, 2012 109 (37) 14761–14766; published ahead of print August 27, 2012, doi:10.1073/pnas.1120432109
8) *Regularity of solutions to the polyharmonic equation in general domains* (with Vladimir Maz'ya), Inventiones Mathematicae, 196 (2014), no. 1, 1–68. http://dx.doi.org/10.1007/s00222-013-0464-1.

Stovall, Betsy
Organizer

Name: Betsy (Lindsay) Stovall
Year of Ph.D: 2009
Institution of Ph.D.: University of California, Berkeley

Current Position:
Assistant Professor, University of Wisconsin-Madison, 2012-present

Award, Honors, and Distinctions:

1) Curvature-related problems in harmonic analysis, NSF 2013-2017
2) International conference in harmonic analysis, NSF 2016-2016
3) Counteracting flatness with affine measures and related problems in harmonic analysis, NSF 2016-2019

Publications:
1) Uniform estimates for Fourier restriction to polynomial curves in R^d. Stovall B. American Journal of Mathematics. 2016 Mar;138(2):449-471. doi: 10.1353/ajm.2016.0021.
2) Uniform bounds for convolution and restricted x-ray transforms along degenerate curves. Dendrinos S, Stovall B. Journal of Functional Analysis. 2015 Jan;268(3). doi: 10.1016/j.jfa.2014.10.012.
3) Blowup behaviour for the nonlinear Klein--Gordon equation. Killip R, Stovall B, Visan M. Mathematische Annalen. 2012 Mar;358(1). doi: 10.1007/s00208-013-0960-z.
4) Uniform estimates for the x-ray transform restricted to polynomial curves. Dendrinos S, Stovall B. Journal of Functional Analysis. 2011 Nov;262(12). doi: 10.1016/j.jfa.2012.03.020.

Street, Brian
Organizer

Name: Brian Street
Year of Ph.D: 2007
Institution of Ph.D.: Princeton University

Current Position:
Associate Professor, University of Wisconsin-Madison, 2016-present

Award, Honors, and Distinctions:
1) 2016 Philip R. Certain & Gary D. Sandefur Distinguished Faculty Award, College of Letters and Science, University of Wisconsin–Madison
2) 7/2014-6/2018 - NSF Grant, *Singular Integrals and Geometry* (DMS 1401671)
3) 6/2013-8/2016 - NSF Grant, *Endpoint Maximal Theorems* (DMS 1201314), co-PI: Seeger
4) 7/2011-6/2014 - NSF Grant, *Multi-parameter singular integrals* (DMS 1066020)
5) 7/2008-6/2011 - NSF Postdoctoral Fellow (DMS 0802587)

Publications:
1) A. Seeger, C. Smart, and B. Street, *Multilinear singular integral forms of Christ-Journ´e type*, to appear in Memoirs of AMS, 136 pages
2) P. Gressman, D. He, V. Kovaˇc, B. Street, C. Thiele, and P. Yung, *On a trilinear singular integral form with determinantal kernel*, Proc. Amer. Math. Soc., 144(8):3465-3477, 2016, 13 pages
3) B. Street, *Singular Differential Equations*, preprint, arXiv:1509.06631, 35 pages
4) B. Street, *Sobolev spaces associated to singular and fractional Radon transforms*, Rev. Mat. Iberoam. 33 (2017), no. 2, 633–748.
5) E. Stein and B. Street, *Multi-parameter singular Radon transforms*, Math. Res. Lett., vol. 18 (2011), no. 2, p. 257-277
6) B. Street, *Multi-parameter singular Radon transforms I: the L2 theory*, J. Anal. Math. 116 (2012), 83-162
7) E. Stein and B. Street, *Multi-parameter singular Radon transforms II: the Lp theory*, Adv. Math. 248 (2013), 736-783
8) E. Stein and B. Street, *Multi-parameter singular Radon transforms III: real analytic curves*, Adv. Math. 229 (2012), no. 4, 2210-2238
9) B. Street, *Multi-parameter Carnot-Carath´eodory balls and the theorem of Frobenius*, Rev. Math. Iberoamericana, Vol 27, No. 2 (2011) 645-732
10) A. Nachman and B. Street, *Reconstruction in the Calder´on Problem with Partial Data*, Comm. Partial Differential Equations, 35 (2010), no. 2, 375-390

Wright, James
Research
Member

Name: Brian Street
Year of Ph.D: 1990
Institution of Ph.D.: University of Wisconsin-Madison

Current Position:
Professor, University of Edinburgh, 2000-present

Award, Honors, and Distinctions:
1) Fellow of the Royal Society of Edinburgh, inducted in 2011
2) Head of Research Theme – Analaysis and its Applications at Univ. of Edinburgh
3) Head of Research Group – Analysis at Univ. of Edinburgh
4) Head of Academic Affairs – MIGSAA at Univ. of Edinburgh

Publications:
1) Lp estimates for operators associated to oscillating plane curves, Duke Math. J. 67 (1992), no. 1, 101–157.
2) Operators associated to flat curves on the Heisenberg group (with A. Carbery, S. Wainger), Internat. Math. Res. Notices 1993, no. 12, 313–317.
3) The Hilbert transform and maximal function along nonconvex curves in the plane (with J. Vance, S. Wainger), Rev. Mat. Iberoamericana 10 (1994), no. 1, 93–121.
4) Hilbert transforms and maximal functions associated to flat curves on the Heisenberg group (with A. Carbery, S. Wainger), J. Amer. Math. Soc. 8 (1995), no. 1, 141–179.
5) Pointwise convergence of spherical means (with A. Seeger, S. Wainger), Math. Proc. Cambridge Philos. Soc. 118 (1995), no. 1, 115–124.
6) Hilbert transforms and maximal functions along variable flat plane curves (with A. Carbery, S.Wainger), J. Fourier Anal. Appl., Kahane Special Issue (1995), 119-139.
7) Lp estimates for operators associated to flat curves without the Fourier transform (with A. Carbery, J. Vance, S. Wainger, D. Watson), Pacific J. Math. 167 (1995), no. 2, 243–262.
8) A variant of the notion of a space of homogeneous type (A. Carbery, J. Vance, S. Wainger), J. Funct. Anal. 132 (1995), no. 1, 119–140.
9) Singular integrals and maximal functions associated to surfaces of revolution (W. Kim, S. Wainger, S. Ziesler), Bull. London Math. Soc. 28 (1996), no. 3, 291–296.
10) Spherical maximal operators on radial functions (with A. Seeger, S. Wainger), Math. Nachr. 187 (1997), 241–265.

COMPLEMENTARY PROGRAM 2016 - 2017

Jarrah, Abdul
Research
Member

Name: Abdul Jarrah
Year of Ph.D: 2002
Institution of Ph.D.: New Mexico State University

Current Position:
Associate Professor, American University of Sharjah, 2009-present

Award, Honors, and Distinctions:
1) 2015-2016. PI on FRG3: A Dynamic Network Model of Macrophages Differentiation, American University of Sharjah, UAE.
2) 2012-2013. PI on FRG3: A Mathematical Model of of the Immune System Response to Duchenne Muscular Dystrophy, American University of Sharjah, UAE.
3) 2009-2013. Co-PI on Polynomial Dynamical Systems Over Finite Fields: From Structure to Dynamics, National Science Foundation, USA.
4) 2005-2008. Co-PI on Mathematical Algorithms for Computer Simulations, National Science Foundation, USA. 2

Publications:
1) A. Jarrah, F. Castiglione, N. Evans, R. Grange, and R. Laubenbacher (2014). A mathematical model of skeletal muscle disease and immune response in the mdx mouse. BioMed Research International, Vol. 2014, Article ID 871810. DOI: 10.1155/2014/871810
2) P. Vera-Licona, A. Jarrah, L. Garcia-Puente, J. McGee, and R. Laubenbacher (2014). An algebra-based method for inferring gene regulatory networks. BMC Systems Biology, Vol. 8, no. 34 (2014): DOI: 10.1186/1752-0509-8-37
3) A. Carbo, R. Hontecillas, B. Kronsteiner, M. Viladomiu, M. Pedragosa, P. Lu, C. Philipson, S. Hoops, M. Marathe, S. Eubank, K. Bisset, K. Wendelsdorf, A. Jarrah, Y. Mei, J. Bassaganya-Riera (2013). Systems modeling of molecular mechanisms controlling cytokine-driven CD4+ T cell differentiation and phenotype plasticity PLOS Computational Biology, Vol. 9, no. 4 (2013): Article ID 1003027. DOI: 10.1371/journal.pcbi.1003027
4) F. Hinkelmann and A. Jarrah (2012). Inferring Biologically Relevant Models: Nested Canalyzing Functions. ISRN Biomathematics, Vol. 2012, Article ID 613174, DOI: 10.5402/2012/613174
5) F. Hinkelmann, D. Murrugarra, A. Jarrah, R. Laubenbacher (2011). A Mathematical Framework for Agent Based Models of Complex Biological Networks. Bull. Math. Bio., Vol. 73, Issue 7, pp. 1583–1602, DOI: 10.1007/s11538-010- 9582-8
6) A. Jarrah, R. Laubenbacher, A. Veliz-Cuba (2010). The Dynamics of Conjunctive and Disjunctive Boolean Network Models. Bull. Math. Bio., Vol. 72, Issue 6, pp. 1425–1447, DOI: 10.1007/s11538-010-9501-z
7) R. Laubenbacher, V. Hower, A. Jarrah, S. V. Torti, V. Shulaev, P. Mendes, F. M. Torti, and S. Akman (2009). A systems biology view of cancer. Biochim Biophys Acta, Vol. 1796, No. 2, pp. 129–139, DOI: 10.1016/j.bbcan.2009.06.001
8) Vera-Licona, Paola, Abdul Jarrah, Luis Garcia-Puente, John McGee, and Reinhard Laubenbacher. "An algebra-based method for inferring gene regulatory networks." BMC Systems Biology 8, no. 34 (March, 2014): [Comment: ACCEPTANCE DATE: MARCH, 2014.]

**Postnikov,
Alexander**
Research
Member

Name: Alexander Postnikov
Year of Ph.D: 1997
Institution of Ph.D.: Massachusetts Institute of Technology

Current Position:
Professor, Massachusetts Institute of Technology, 2001-present

Award, Honors, and Distinctions:
1) MIT's Solomon Buchsbaum AT&T research fund, 2002
2) Sloan fellowship, 2003
3) NSF Career Award, 2005
4) Department's Edmund F. Kelly research award, 2006

Publications:
1) Proof of a conjecture of Bergeron, Ceballos and Labbé, Darij Grinberg, Alexander Postnikov, arXiv:1603.03138 [math.CO]
2) Root polytopes, Tutte polynomials, and a duality theorem for bipartite graphs, Tamás Kálmán, Alexander Postnikov, arXiv:1602.04449 [math.CO]
3) Arrangements of equal minors in the positive Grassmannian, Miriam Farber, A. Postnikov, Adv. Math. 300 (2016), 788-834. arXiv:1502.01434 [math.CO]
4) Poset vectors and generalized permutohedra, Dorian Croitoru, SuHo Oh, A. Postnikov arXiv:1309.1994 [math.CO]
5) Grassmannian geometry of scattering amplitudes, Nima Arkani-Hamed, Jacob L. Bourjaily, Freddy Cachazo, Alexander B. Goncharov, Alexander Postnikov, Jaroslav Trnka, Cambridge University Press, Cambridge, 2016. ix+194 pp. Preprint version ``Scattering Amplitudes and the Positive Grassmannian'': arXiv:1212.5605 [hep-th]
6) On-shell structures of MHV amplitudes beyond the planar limit, Nima Arkani-Hamed, Jacob L. Bourjaily, Freddy Cachazo, Alexander Postnikov, Jaroslav Trnka, J. High Energy Phys. 2015, no. 6, 179, 15 pp.
7) Two counterexamples for power ideals of arrangements, Federico Ardila, A. Postnikov, Transactions of the American Mathematical Society, 367 (2015), no. 5, 3759â€"3762. arXiv:1211.1368 [math.CO]
8) Schur times Schubert via the Fomin-Kirillov algebra, Karola Meszaros, Greta Panova, A. Postnikov, Electron. J. Combin. 21 (2014), no. 1, Paper 1.39, 22 pp. arXiv:1210.1295 [math.CO]
9) Alcoved polytopes II, Thomas Lam, A. Postnikov arXiv:1202.4015 [math.CO]
10) Weak separation and plabic graphs, Suho Oh, A. Postnikov, David E Speyer, Proc. Lond. Math. Soc. (3) 110 (2015), no. 3, 721-754. arXiv:1109.4434 [math.CO]

VI.   PUBLICATIONS SUMMARY

The 19 NSA funded researchers worked on a total of 57 papers during their stay at MSRI.

First Name	Last Name	Paper Titles	Co-authors	Paper Status
Michael	Lacey	Sparse Bounds for Spherical Maximal Functions	None	Accepted/Appeared
Michael	Lacey	On Convergence of Oscillatory Ergodic Hilbert Transforms	Ben Krause, Mate Wierdl	Accepted/Appeared
Karen	Vogtmann	The topology and geometry of automorphism groups of free groups	None	Accepted/Appeared
James	Wright	A maximal restriction theorem and Lebesgue points of functions in F(L^p)	Detlef Maller, Fulvio Ricci	Posted
Jeffrey	Brock	Limit sets of Weil-Petersson geodesics	Chris Leininger, Karsa Rafi and Babak Modami	Posted
Svitlana	Mayboroda	Bounds on layer potentials with rough inputs for higher order elliptic equations	Ariel Barton, Steve Hofmann	Submitted
Svitlana	Mayboroda	Dirichlet and Neumann boundary values of solutions to higher order elliptic equations	Ariel Barton, Steve Hofmann	Submitted
Svitlana	Mayboroda	The Neumann problem for higher order elliptic equations with symmetric coefficients	Ariel Barton, Steve Hofmann	Submitted
Pallavi	Dani	Commensurability for certain right-angled Coxeter groups and geometric amalgams of free groups	Emily Stark, Anne Thomas	Submitted
Svitlana	Mayboroda	Elliptic theory for sets with higher co-dimensional boundaries	Guy David, Joseph Feneuil	Submitted
Mark	Feighn	Algorithmic constructions of relative train track maps and CTs	Michael Handel	Submitted
Simon	Marshall	Lower bounds for Maass forms on semisimple groups	Farrell Brumley	Submitted
Svitlana	Mayboroda	Dahlberg's theorem in higher co-dimension	G. David, J. Feneuil	Submitted
Kannan	Soundararajan	Non-zero coefficients of half integral weight modular forms mod ell	Joel Bellaiche and Ben Green	Submitted
Loredana	Lanzani	The role of an integration formula in the study of Cauchy-Leray integrals	Elias Stein	Submitted
Lola	Thompson	A generalization of the practical numbers	Nicholas Schwab and Lola Thompson	Submitted
Karen	Vogtmann	Homology stability for surface groups	Allen Hatcher	Submitted
Mark	Feighn	The boundary of S	Mladen Bestvina and Patrick Reynolds	Rough/Draft

Kevin	Ford	Long gaps in sieved sets	Sergei Konyagin, James Maynard, Carl Pomerance, Terence Tao	Rough/Draft
Svitlana	Mayboroda	Exponential Decay of Fundamental Solution for Some Schrodinger Operators	Bruno Poggi	Rough/Draft
Lola	Thompson	Divisor-sum fibers	P. Pollack, Carl Pomerance	Rough/Draft
Kevin	Ford	Large gaps in sieved sets	Konyagin, Maynard, Tao, Pomerance	Rough/Draft
Kannan	Soundararajan	A new proof of Halasz's theorem, and its consequences	Andrew Granville and Adam Harper	Rough/Draft
Kannan	Soundararajan	The structure of multipicative functions with small partial sums	Dimitris Koukoulopoulos	Rough/Draft
Betsy	Stovall	Scalable bounds for Restriction to the hyperbolic paraboloid		Rough/Draft
Betsy	Stovall	Convenient Coordinates	Street	Rough/Draft
Brian	Street	Coordinates Adapted to Vector Fields I	Betsy Stovall	Rough/Draft
Lola	Thompson	Primes, divisor sums, and degrees of divisors of x^n-1	Leo Gitin and Lola Thompson	Rough/Draft
Karen	Vogtmann	On the bordification of Outer space	Kai-Uwe Bux	Rough/Draft
Svitlana	Mayboroda	A_infty of elliptic measures in the case of higher-codimensions	Zihui Zhao	Rough/Draft
Svitlana	Mayboroda	Semigroup methods for higher order differential equations	Ariel Barton, Pascal Auscher, Moritz Egert	Working Notes
Svitlana	Mayboroda	S<N estimates for higher order equations	Ariel Barton	Working Notes
Svitlana	Mayboroda	Free Boundary Regularity for Co-Dimension > 1 Harmonic Measure	Guy David	Working Notes
Mark	Feighn	TBA	Bestvina, Guirardel, Levitt, Wang	Working Notes
Adam	Harper	Extreme biases in prime number races with many contestants	Kevin Ford, Youness Lamzouri	Working Notes
Dimitris	Koukoulopoulos	On the Hooley Delta function	Ben Green, Kevin Ford	Working Notes
Michael	Lacey	A Discrete Stein-Wainger Theorem on ℓ^2 with a Restricted Supremum	Laura Cladek, Ben Krause	Working Notes
Michael	Lacey	Sparse bounds for Bochner Riesz	Maria Reguera	Working Notes
Michael	Lacey	Sparse versions of the Bourgain Lemma	Ben Krause, Francesco di Plinio, Robert Kesler	Working Notes
Loredana	Lanzani	Holomorphic extensions: counterexamples to L^p theorey	E. M. Stein and L. Lanzani	Working Notes
Loredana	Lanzani	On the stabiity of symmetrization of Cauchy-like kernels	M. Pramanik and L. Lanzani	Working Notes

Christopher	Leininger	Universal trees and polynomials for free-by-cyclic groups	S. Dowdal and I. Kapovich	Working Notes
James	Wright	On the L^1-weak bound of a certain maximal singular operator	Victor Lie	Working Notes
Simon	Marshall	Endoscopy and cohomology of U(n,1)	Sug Woo Shin	Working Notes
Simon	Marshall	Endpoint bounds for Fourier restriction to group orbits and higher rank eigenfunctions	Andreas Seeger	Working Notes
Svitlana	Mayboroda	Regularity and Neumann problems for complex-coefficient equations	Dindos, Pipher	Working Notes
Alexander	Postnikov	Maps of hypercubes	Abdul Jarrah	Working Notes
Alexander	Postnikov	Hyperplanes, zonotopes, and generalization of k-equal hyperplane arrangements	Helene Barcelo	Working Notes
Alexander	Postnikov	Purity and separation for oriented matroids	Pavel Galasha	Working Notes
Loredana	Lanzani	Symmetrization of Cauchy-like kernels	Malabika Pramanik	Working Notes
Dinakar	Ramakrishnan	Trace Inequalities and anarithmetic application		Working Notes
Kannan	Soundararajan	Weak subconvexity for central values of automorphic L-functions	Jesse Thorner	Working Notes
Kannan	Soundararajan	Variant of the four squares theorem	Ayla Gafni	Working Notes
Betsy	Stovall	Uniform bounds for translation noninvariant averages on curves	Dendrinos, Street	Working Notes
Betsy	Stovall	Nonendpoint Fourier restriction inequalities are extremizable	Christ, Flock	Working Notes
Lola	Thompson	Sieve of Eratosthenes in Less Space II (working title)	Harald Helfgott, Lola Thompson	Working Notes
Lola	Thompson	A problem of Erdos on kth power non-residues (working title)	Pieter Moree, Paul Pollack, Lola Thompson	Working Notes