Matthias Beck

Department of Mathematics	Phone: +1 415 405 3473
San Francisco State University	Fax: +1 415 338 1461
1600 Holloway Ave	beck@math.sfsu.edu
San Francisco, CA 94132	http://math.sfsu.edu/beck

Current Position

Associate Professor (with tenure), San Francisco State University.

Previous Positions

Robert Riley Assistant Professor, Binghamton University (SUNY), Fall 2000 – Spring 2003.

Postdoctoral Fellow, Mathematical Sciences Research Institute, Berkeley, Fall 2003.

Member, Max-Planck-Institut für Mathematik, Bonn, Spring/Summer 2004.

Member, Mathematical Sciences Research Institute, Berkeley, Spring 2008.

Assistant Professor, San Francisco State University, Fall 2004 – Spring 2009.

Education

Ph.D. Mathematics, Temple University, August 2000.
Advisor: S. Robins, dissertation: *The arithmetic of rational polytopes.*

Diplom Mathematics, minor Physics, Universität Würzburg, Germany, July 1997.
Advisor: G. Köhler, Diplomarbeit: *Number theoretical algorithms using elliptic curves.*

Staatsexamen Mathematics and Physics (Secondary Education), Universität Würzburg, Germany, June 1997.

Research

Discrete and Computational Geometry, Analytic Number Theory.

Books:

[1] M. Beck and S. Robins, Computing the continuous discretely: Integer-point enumeration in polyhedra. *Springer Undergraduate Texts in Mathematics*, 2007. German translation (by K. Eickmeyer): Das Kontinuum diskret berechnen. *Springer Lehrbuch*, 2008.

[2] M. Beck and R. Geoghegan, The discrete and the continuous: Basic training for deeper mathematics, in preparation.

Edited Volumes:

[1] A. Barvinok, M. Beck, C. Haase, B. Reznick, and V. Welker, eds. Integer points in Polyhedra. Geometry, Number Theory, Algebra, Optimization. Proceedings of the AMS-IMS-SIAM Joint Summer Research Conference in Snowbird, Utah (July 12–18, 2003).
Contemporary Mathematics **374**, American Mathematical Society, 2005.

[2] M. Beck, C. Haase, B. Reznick, M. Vergne, V. Welker, and R. Yoshida, eds. Integer points in Polyhedra. Proceedings of the AMS-IMS-SIAM Joint Summer Research Conference in Snowbird, Utah (June 2006).
Contemporary Mathematics **452**, American Mathematical Society, 2008.

Papers:

[1] M. Beck, The reciprocity law for Dedekind sums via the constant Ehrhart coefficient, *American Mathematical Monthly* **106**, no. 5 (1999), 459–462.

[2] M. Beck, A closer look at lattice points in rational simplices, *Electronic Journal of Combinatorics* **6**, no. 1 (1999), R 37 (9 pages).

[3] M. Beck, Counting lattice points by means of the residue theorem, *Ramanujan Journal* **4**, no. 3 (2000), 299–310.

[4] M. Beck, I. M. Gessel, and T. Komatsu, The polynomial part of a restricted partition function related to the Frobenius problem, *Electronic Journal of Combinatorics* **8**, no. 1 (2001), N 7 (5 pages).

[5] M. Beck, Multidimensional Ehrhart reciprocity, *Journal of Combinatorial Theory Series A* **97**, no. 1 (2002), 187–194.

[6] M. Beck and S. Robins, Explicit and efficient formulas for the lattice point count inside rational polygons, *Discrete & Computational Geometry* **27** (2002), 443–459.

[7] M. Beck and T. Zaslavsky, A shorter, simpler, stronger proof of the Meshalkin-Hochberg-Hirsch bounds on componentwise antichains, *Journal of Combinatorial Theory Series A* **100** (2002), 196–199.

[8] M. Beck, R. Diaz, and S. Robins, The Frobenius problem, rational polytopes, and Fourier-Dedekind sums, *Journal of Number Theory* **96** (2002), 1–21.

[9] M. Beck and T. Zaslavsky, A Meshalkin theorem for projective geometries, *Journal of Combinatorial Theory Series A* **102** (2003), 433–441.

[10] M. Beck, Dedekind cotangent sums, *Acta Arithmetica* **109**, no. 2 (2003), 109–130.

[11] M. Beck, M. Cohen, J. Cuomo, and P. Gribelyuk, The number of "magic" squares, cubes, and hypercubes, *American Mathematical Monthly* **110**, no. 8 (2003), 707–717.

[12] M. Beck, D. Einstein, and S. Zacks, Some experimental results on the Frobenius problem, *Experimental Mathematics* **12**, no. 3 (2003), 263–269.

[13] M. Beck and D. Pixton, The Ehrhart polynomial of the Birkhoff polytope, *Discrete & Computational Geometry* **30**, no. 4 (2003), 623–637.

[14] M. Beck and S. Robins, A formula related to the Frobenius problem in two dimensions, *Number Theory. New York Seminar 2003* (D. Chudnovsky, G. Chudnovsky, M. Nathanson, eds.), pp. 17–23. Springer, Berlin, 2004.

[15] M. Beck and S. Zacks, Refined upper bounds for the linear Diophantine problem of Frobenius, *Advances in Applied Mathematics* **32**, no. 3 (2004), 454–467.

[16] M. Beck and S. Robins, Dedekind sums: a combinatorial-geometric viewpoint, *Unusual Applications of Number Theory* (M. Nathanson, ed.), *DIMACS Series in Discrete Mathematics and Theoretical Computer Science* **64** (2004), 25–35.

[17] M. Beck, The partial-fractions method for counting solutions to integral linear systems, *Discrete & Computational Geometry* **32** (2004), 437–446 (special issue in honor of Louis Billera).

[18] M. Beck, J. A. Deloera, M. Develin, J. Pfeifle, and R. P. Stanley, Coefficients and roots of Ehrhart polynomials, *Contemporary Mathematics* **374** (2005), 15–36.

[19] M. Beck, B. Chen, L. Fukshansky, C. Haase, A. Knutson, B. Reznick, S. Robins, and A. Schuermann, Problems from the Cottonwood Room, *Contemporary Mathematics* **374** (2005), 179–191.

[20] M. Beck, B. C. Berndt, O-Y. Chan, and A. Zaharescu, Determinations of analogues of Gauss sums and other trigonometric sums, *International Journal of Number Theory* **1**, no. 3 (2005), 333–356.

[21] M. Beck, S. Robins, and S. Zacks, Higher-dimensional Dedekind sums and their bounds arising from the discrete diagonal of the n-cube, *Advances in Applied Mathematics* **36**, no. 1 (2006), 1–29.

[22] M. Beck, X. Wang, and T. Zaslavsky, A unifying generalization of Sperner's theorem, *More Sets, Graphs and Numbers: A Salute to Vera Sos and Andras Hajnal* (E. Gyari, G. O. H. Katona, and L. Lovasz, eds.), *Bolyai Society Mathematical Studies* **15**, pp. 9–24. Springer, Berlin, and Janos Bolyai Mathematical Society, Budapest, 2006.

[23] M. W. Baldoni, M. Beck, C. Cochet, and M. Vergne, Volume computation for polytopes and partition functions for classical root systems, *Discrete & Computational Geometry* **35** (2006), 551–595.

[24] M. Beck and S. Hoşten, Cyclotomic polytopes and growth series of cyclotomic lattices, *Mathematical Research Letters* **13**, no. 4 (2006), 607–622.

[25] M. Beck and T. Zaslavsky, Inside-out polytopes, *Advances in Mathematics* **205**, no. 1 (2006), 134–162.

[26] M. Beck and T. Zaslavsky, The number of nowhere-zero flows in graphs and signed graphs, *Journal of Combinatorial Theory Series B* **96**, no. 6 (2006), 901–918.

[27] M. Beck and T. Zaslavsky, An enumerative geometry for magic and magilatin labellings, *Annals of Combinatorics* **10**, no. 4 (2006), 395–413.

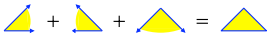
[28] M. Beck, Geometric proofs of polynomial reciprocity laws of Carlitz, Berndt, and Dieter, *Diophantine analysis and related fields 2006*, pp. 11–18, Sem. Math. Sci. 35, Keio University, Yokohama, 2006.

[29] M. Beck and F. Sottile, Irrational proofs for three theorems of Stanley, *European Journal of Combinatorics* **28**, no. 1 (2007), 403–409.

[30] M. Beck, S. Sam, and K. Woods, Maximal periods of (Ehrhart) quasi-polynomials, *Journal of Combinatorial Theory Series A* **115**, no. 3 (2008), 517–525.

[31] M. Beck, B. Nill, B. Reznick, C. Savage, I. Soprunov, and Z. Xu, Let me tell you my favorite lattice-point problem..., *Contemporary Mathematics* **452** (2008), 179–187.

[32] M. Beck, C. Haase, and A. Matthews, Dedekind-Carlitz polynomials as lattice-point enumerators in rational polyhedra, *Mathematische Annalen* **341**, no. 4 (2008), 945–961.

[33] M. Beck, C. Haase, and F. Sottile,  *Mathematical Intelligencer* **31**, no. 1 (2009), 9–17.

[34] M. Beck and M. Halloran, Finite trigonometric character sums via discrete Fourier analysis, to appear in *International Journal of Number Theory*.

[35] M. Beck and A. Stapledon, On the log-concavity of Hilbert series of Veronese subrings and Ehrhart series, to appear in *Mathematische Zeitschrift*.

[36] M. Beck, C. Haase, and S. Sam, Grid graphs, Gorenstein polytopes, and domino stackings, to appear in *Graphs and Combinatorics*.

[37] M. Beck, A. Van Herick, Enumeration of 4x4 magic squares, to appear in *Mathematics of Computation*.

Invited Talks:

Invited Hour Talks: Clifford Lectures at Tulane University, Discrete Geometry Meeting at the Mathematisches Forschungsinstitut Oberwolfach (Germany), 16th International Conference Jangjeon Mathematical Society in Antalya (Turkey), Pacific North West Number Theory Conference at Simon Fraser University, Conference on Diophantine Analysis and Related Fields at Keio University (Japan).

Conference Talks: Joint Mathematics Meetings at San Diego and Washington, D.C., Mathfests in Burlington and Knoxville, AMS Meetings at Raleigh, Murfreesboro, Cincinnati, Storrs, Williams, Toronto, Providence, and Gainesville, Discrete Mathematics Days at University of Massachusetts at Amherst and UC Davis, Integers Combinatorial Number Theory Conference at the University of West Georgia, Combinatorial and Additive Number Theory Conference at CUNY, Illinois Number Theory Conference,

Colloquia: University of Kentucky, University of San Francisco, Undergraduate Connecticut Valley Colloquium, Sonoma State University, Reed College, Universität Marburg, Universitat de Barcelona, Haverford/Swarthmore Colleges, San Francisco State University, Williams College, University of Delaware, University at Albany (SUNY), Vassar College, University of Rochester, Universität Würzburg, Gettysburg College, Binghamton University (SUNY), Carleton University, SUNY Geneseo, Dickinson College, SUNY Potsdam.

Seminars: North Carolina State University, Stanford University, Technische Universität Berlin, UC Berkeley, Université Pierre et Marie Curie (Paris 6), Max-Planck-Institut für Mathematik, Mathematical Sciences Research Institute, Quebec-Vermont Number Theory Seminar, McGill University, University of Washington, Cornell University, University of Kentucky, UC Davis, University

of Massachusetts, Bryn Mawr College, William Paterson University, SUNY Albany, University of Scranton, Binghamton University (SUNY), Carleton University, University of Pennsylvania, University of Rochester, City University of New York.

Outreach: Math Circles in Berkeley, Marin, Oakland, San Francisco, San Jose, and Stanford; Math Teacher Circle at the American Institute of Mathematics and the Mathematical Sciences Research Institute; REUs at Lafayette College and MSRI-UP; Mathcamp in Portland, OR.

Grants and Awards

- National Science Foundation
  Research grant DMS-0810105 *Computations in Ehrhart Theory* (PI, $140,414).
  GK-12 grant DGE-0841164 *Creating Momentum through Communicating Mathematics* (PI, $2,960,937).

- San Francisco State University
  Implementation grant, Center for Science & Mathematics Education (2009).
  Presidential Award for Professional Development (pre-tenure sabbatical, 2008).
  Summer research grants (2005 & 2006).

Teaching

- Dept. of Mathematics, San Francisco State University *since Fall 2004*
  Assistant Professor. Courses taught: *Concepts of the Number System* (for future K–8 teachers), *Calculus II*, *Proofs and Exploration*, *Math Circle Seminar*, *Number Theory*, *Introduction to Functions of a Complex Variable*, *Modern Algebra I & II*, *Math Circle Seminar*, *Discrete Geometry* (graduate), *Computational Discrete Geometry* (graduate, co-taught with R. Singh, Computer Science Department).

- Dept. of Mathematical Sciences, Binghamton University (SUNY) *Fall 2000 – Spring 2003*
  Visiting Assistant Professor. Courses taught: *Calculus II*, *Number Systems*, *Complex Variables*, *Combinatorics*, *Complex Analysis* (graduate), *Discrete Geometry* (graduate).

- Mathematics Department, Temple University *Fall 1997 – Spring 2000*
  Adjunct faculty for *Discrete Structures of Computer Science*.
  Research assistant for *Calculus On the Web* (funded by the National Science Foundation).

- Mathematics/Physics Departments, Universität Würzburg *Winter 1995 – Summer 1997*
  Teaching assistant for *Number Theory*, *Modern Algebra*, *Topology*.
  Teaching assistant for the Physics (Secondary Education) lab.

- Mathematics Department, SUNY Oneonta *Fall 1994 – Spring 1995*
  Teaching assistant for *Calculus* and *Calculus–based Physics*.

- Karl–Ernst Gymnasium Amorbach, Germany *Spring 1992 / Fall 1993*
  Student teacher for Mathematics and Physics (Secondary Education).

Service and Related Experience

- **Committee service**: San Francisco State University
  Faculty Council (Mathematics), Hiring Committee (Mathematics), Graduate Committee (Mathematics), Website Committee (Mathematics), Professional Development Council, Honorary Degree Committee, Liberal Studies Council.

- **Seminar coorganizer**
  Coorganizer (with L. Anderson and T. Zaslavsky) of weekly Combinatorics and Number Theory Seminar at Binghamton University (SUNY).
  Coorganizer (with F. Ardila, J. Gubeladze and S. Hosten) of weekly Algebra-Geometry-Combinatorics Seminar at San Francisco State University.

- **Conference coorganizer**
  Coorganizer (with A. Barvinok, C. Haase, B. Reznick, M. Vergne, and V. Welker) of the 2003 AMS-IMS-SIAM Summer Research Conference *Integer Points in Polyhedra. Geometry, Number Theory, Algebra, Optimization.*
  Coorganizer (with R. Datta, J. Gubeladze, S. Hoşten, T. Hsu, N. Thiem, A. Schilling, M. Vazirani, and A. Yong) of the *Bay Area Discrete Math Day*, 2004–2006.
  Coorganizer (with S. Robins) of the 2005 MSRI/PIMS/Banff summer school *Integer-point enumeration in polyhedra.*
  Coorganizer (with F. Ardila) of the special session *Enumerative Aspects of Polytopes* at the Spring 2006 AMS Western Section Meeting.
  Coorganizer (with C. Haase, B. Reznick, M. Vergne, V. Welker, and R. Yoshida) of the 2006 AMS-IMS-SIAM Summer Research Conference *Integer Points in Polyhedra. Geometry, Number Theory, Representation Theory, Algebra, Optimization, Statistics.*
  Coorganizer (with S. Wagon and K. Woods) of the special session *The Linear Diophantine Problem of Frobenius*, 2008 Joint Mathematics Meetings.
  Coorganizer (with L. Fukshansky) of the special session *Diophantine Problems and Discrete Geometry* at the Spring 2008 AMS Western Section Meeting.
  Coorganizer (with K. O'Hara, A. Serenevy, and S. Vandervelde) of the MSRI workshop *Great Circles 2009.*
  Coorganizer (with C. Haase) of the special session *Algebra & Number Theory With Polyhedra* at the Spring 2009 AMS Western Section Meeting.
  Member of the Program Committee of the 21st International Conference *Formal Power Series & Algebraic Combinatorics* 2009, Linz, Austria.
  Coorganizer (with P. Gunnels and A. Sikora) of the workshop *Dedekind Sums in Geometry, Topology, and Arithmetic* 2009, Banff Research Station, Canada.
  Coorganizer (with F. Ardila) of the 2010 conference *Formal Power Series and Algebraic Combinatorics* at San Francisco State University.

- **Faculty adviser**
  Adviser to the Undergraduate Math Club and the MAA Student Chapter at Binghamton University (SUNY) (2000–2003).
  Graduate Adviser for the San Francisco State University Mathematics Department (2006/2007).
  Member of several M.A. and Ph.D. committees at Binghamton University (SUNY), San Francisco State University, UC Berkeley, Universidad de Los Andes (Bogotá, Colombia), and Uni-

versität Magdeburg (Germany).
Principal thesis adviser for Aaron Dall (SFSU MA'08), Eric Etu (SFSU MA'07), Mary Halloran (SFSU MA'07), Asia Matthews (SFSU MA'07), Dorothy Moorefield (SFSU MA'06), Kim Seashore (SFSU MA'07), and Andrew Van Herick (SFSU MA'07).
Mentor for the National Alliance for Doctoral Studies in the Mathematical Sciences.

- **Editor** for the *Journal of Number Theory* (since 2004).
- **Reviewer** for *Mathematical Reviews* and *Zentralblatt MATH*.
- **Referee** for *Advances in Applied Mathematics, Advances in Mathematics, Applied Mathematics Letters, American Mathematical Monthly, AMS Electronic Research Announcements, Annales de l'Institut Fourier, College Math Journal, Discrete & Computational Geometry, Discrete Applied Mathematics, Discrete Mathematics, L'Enseignement Mathématique, Electronic Journal of Combinatorics, European Journal of Combinatorics, Experimental Mathematics, Graphs and Combinatorics, Integers (Electronic Journal of Combinatorial Number Theory), International Journal of Number Theory, Journal für die reine und angewandte Mathematik, Journal of Algebraic Combinatorics, Journal of Combinatorial Theory, Journal of Integer Sequences, Journal of Mathematical Analysis and Applications, Journal of Number Theory, Mathematics of Computation, Mathematics of Operations Research, Mathematische Annalen, Monatshefte für Mathematik, Moscow Mathematical Journal, Proceedings of the Royal Society A, Ramanujan Journal, Transactions of the AMS*.
- **Grant Reviewer** for the *National Science Foundation* and the *Austrian Science Fund*.
- **Director**: $(\mathrm{CM})^2$ Fellowship Program, San Francisco State University (since 2009)
  A five-year NSF-funded GK-12 program for graduate students aiming for Ph.D. programs.
- **Co-Director**: San Francisco Math Circle (since 2005)
  An integrated weekly program for teachers and students in 6–11 grade, centering around intriguing and challenging problems.
- **Councilor**: Council on Undergraduate Research (2003–2005)
  Councilor of the Mathematics and Computer Science Division.
- **Team member**: `www.mathnerds.com` (1999–2005)
  Assisted and gave hints to mathematical questions asked over the internet.