

Curriculum Vita

Michael J. Falk
Professor and Chair
Department of Mathematics and Statistics
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Education

B.A. Bennington College, 1977.
M.A. University of Wisconsin-Madison, 1979.
Ph.D. University of Wisconsin-Madison, 1983.

Dissertation

Geometry and topology of hyperplane arrangements (thesis advisor – Peter Orlik).

Academic employment

2014 – Northern Arizona University, Department of Mathematics and Statistics,
Department Chair
1996 – Northern Arizona University, Professor.
May - June, 2012 Universität Bremen, Bremen, Germany, Guest Professor
January - April, 2012 U.S. Fulbright Scholar to Ireland, Dublin City University, Dublin, Ireland.
October - November, 2011 Max-Planck Institute for Mathematics, Bonn, Germany, Guest Researcher.
and April - May, 2012
December, 2009 Mathematical Sciences Research Institute, Berkeley, CA, General Member.

August - December, 2004 Mathematical Sciences Research Institute, Berkeley, CA, General Member
and Program Organizer.
May-June, 1999 Université de Nantes Laboratoire de Mathématiques, Professeur Invité.
January-February, 1997 Mathematical Sciences Research Institute, Berkeley, CA
General Member.
1994 – 1995 University of Wisconsin - Madison, Honorary Fellow and
Visiting Associate Professor.
1991 – 1996 Northern Arizona University, Associate Professor.
1986 – 1991 Northern Arizona University, Assistant Professor.
1984 – 1986 University of Iowa, Visiting Assistant Professor.
1983 – 1984 Michigan Technological University, Visiting Assistant Professor.

Publications

Milnor fibers and non-crossing partitions, with Thomas Brady and Colum Watt, *Algebraic and Geometric Topology*, submitted.

Algebras and valuations related to the Tutte polynomial, with J.P.S. Kung, invited book chapter, *CRC Handbook on the Tutte Polynomial and Related Topics*, under review.

An equivariant discrete model for complexified arrangement complements, with E. Delucchi, *Proceedings of the American Mathematical Society* **145** (2017), 955-970.

Configuration spaces and BGG resolutions, with V. Schechtman and A. Varchenko, *Journal de L'Ecole polytechnique - Mathematiques* **1** (2014), 225-245.

Resonance varieties and tropical geometry (extended abstract), *Oberwolfach Reports* **4**, Issue 9, 2012.

The contravariant form on singular vectors of a projective arrangement, with A. Varchenko, in *Configuration Spaces: Algebra, Combinatorics, Topology*, A. Bjorner, F. Cohen, C. De Concini, C. Procesi, M. Salvetti, eds., Edizioni della Normale, Scuola Normale Superiore, Pisa, 2012. [arXiv:1108.3871](#).

Pure braid groups are not residually free, with D. Cohen and R. Randell, in *Configuration Spaces: Algebra, Combinatorics, Topology*, A. Bjorner, F. Cohen, C. De Concini, C. Procesi, M. Salvetti, eds., Edizioni della Normale, Scuola Normale Superiore, Pisa, 2012. [arXiv:1106.4602](#).

Vanishing products of one-forms and critical points of master functions, with D. Cohen, G. Denham, and A. Varchenko. *Arrangements of Hyperplanes - Sapporo 2009*, Adv. St. Pu. Math., **62**, Math. Soc. Japan, 2012, pp. 75 - 107.

Critical points and resonance of hyperplane arrangements, with D. Cohen, G. Denham, and A. Varchenko, *Canadian Journal of Mathematics*, **63**, No. 5, (2011), 1038-1057.

Geometry and combinatorics of resonant weights, in *Arrangements, Local Systems, and Singularities, CIMPA Summer School, Galatasaray University, Istanbul, 2007*, (F.El Zein, A. Suciu, M.Tosun, M. Uludağ, S. Yuzvinsky, eds.), Progress in Mathematics Series **283**, 155-176, Birkhäuser Basel, 2010.

Resonance and zeros of logarithmic one-forms (extended abstract), *Oberwolfach Reports* Vol. 4, No. 3 (2007), 2343-2345.

Resonance varieties over fields of characteristic p , *Int. Math. Research Notices*, Vol. 2007, article ID rnm009, 25 pages, doi:10.1093/imrn/rnm009.

Multinets, resonance varieties, and pencils of plane curves, with S. Yuzvinsky, *Compositio mathematica*, **143** No. 4 (2007), 1069-1088.

Line-closed matroids, quadratic algebras, and formal arrangements, *Advances in Applied Mathematics*, **28** (2002), 250-271.

Parallel connections and bundles of arrangements, with N. Proudfoot, *Topology and Its Applications*, **118** (2002), 65-83.

Combinatorial and algebraic structure in Orlik-Solomon algebras, *European Journal of Combinatorics*, **22** (2001), 687-698.

On the homotopy theory of arrangements, II, with R. Randell, in *Arrangements - Tokyo 1998*, Advanced Studies in Pure Mathematics **27**, 93-125, Japan Mathematical Society and Kinokuniya, 2000.

Tutte polynomials and Orlik-Solomon algebras, with C. Eschenbrenner, *J. Algebraic Combinatorics*, **10** (1999), 189-199.

Arrangements and cohomology, *Annals of Combinatorics* **1** (1997), 135-157.

β nc bases for cohomology of local systems on hyperplane complements, with H. Terao, *Transactions of the American Mathematical Society* **379** (1997), 189-202.

$K(\pi, 1)$ arrangements, *Topology* **34** (1995), 141-154.

A note on discriminantal arrangements, *Proceedings of the American Mathematical Society* **122** (1994), 1221-1227.

Homotopy types of line arrangements, *Inventiones mathematicae* **111** (1993), 139-150.

A geometric duality for order complexes and hyperplane complements, *European Journal of Combinatorics* **13** (1992), 351-356.

On the algebra associated with a geometric lattice, *Advances in Mathematics* **80** (1990), 152-163.

The cohomology and fundamental group of a hyperplane complement, *Singularities*, Contemporary Mathematics **90**, 55-72, American Mathematical Society, Providence, 1989.

Pure braid groups and products of free groups, with R. Randell, *Braids*, Contemporary Mathematics **78**, 217-228, American Mathematical Society, Providence, 1988.

The minimal model of the complement of an arrangement of hyperplanes, *Transactions of the American Mathematical Society* **509** (1988), 543-556.

On the homotopy theory of arrangements, with R. Randell, *Complex Analytic Singularities*, Advanced Studies in Pure Mathematics **8**, 101-124, North-Holland, Amsterdam, 1987.

The lower central series of generalized pure braid groups, with R. Randell, *Geometry and Topology*, 103-108, Marcel Dekker, New York, 1986.

The lower central series of a fiber-type arrangement, with R. Randell, *Inventiones mathematicae* **82** (1985), 77-88.

Other publications

Discriminantal bundles, arrangement groups, and subdirect products of free groups, with D. Cohen and R. Randell, in revision, [arXiv:1008.0417](https://arxiv.org/abs/1008.0417).

Arrangements – Tokyo 1998, editor (with H. Terao), Japan Mathematical Society and Kinokuniya, Tokyo, 2000.

Complex hyperplane arrangements, with A. Suciu, *Emissary*, Spring, 2005, 4-6.

Selected Presentations¹

On the cohomology of the Milnor fiber, invited 60-minute talk, Summer Conference on Hyperplane Arrangements, Hokkaido University, Sapporo, Japan, August, 2016.

Milnor fibers of arrangements, invited 20-minute talk, Special Session on Topology and Combinatorics of Arrangements (in honor of Mike Falk), Spring Eastern Section Meeting of the AMS, Stony Brook University, Stony Brook, NY, March, 2016.

Tutorial: Matroids, Workshop on Frames and Algebraic & Combinatorial Geometry, Institute for Algebra, Geometry, Topology, and their Applications, Universität Bremen, Bremen, Germany, July, 2015.

On graphic arrangement groups, invited 45-minute lecture, Computational Geometric Topology in Arrangement Theory, Institute for Computational and Experimental Research in Mathematics, Providence, RI, July, 2015.

Rigidity of arrangements, Perspectives in Lie Theory Workshop - Algebraic topology, geometric and combinatorial group theory, Pisa, Italy, February, 2015.

¹invited 60-minute lecture unless otherwise noted

BGG resolutions and configuration spaces, Configuration Spaces - Geometry, Topology and Representation Theory, Il Palazzone, Cortona, Italy, September, 2014.

Tropical aspects of resonance, FRG: Hyperplane Arrangements, Wonderful Compactifications, and Tropicalization, Banff International Research Station, Banff, Canada, April, 2014.

Milnor fibers and non-crossing partitions, Joint International Meeting of the American Mathematical Society and the Romanian Mathematical Society, Special Session on Geometry and Topology of Hyperplane Arrangements, Alba Iulia, Romania, June, 2013.

Extensions of rank-one local systems over arrangement complements, Experimental and Theoretical Methods in Algebra, Geometry, and Topology, Eforie Nord, Romania, June, 2013.

Milnor fibers and non-crossing partitions, Hyperplane arrangements: Combinatorial and Geometric Aspects, Rühr-Universität Bochum, Bochum Germany, February, 2013.

Milnor fibers and non-crossing partitions, Arrangements in Pyrenees, Université de Pau, Pau, France, June, 2012.

Critical points of master functions, Universiät Bremen Mathematics Colloquium, Bremen, Germany, May, 2012.

Resolutions of rank-one local systems on hyperplane complements, Workshop on Arrangements and Configuration Spaces, Institute for Algebra, Geometry, Topology, and their Applications, Universität Bremen, Bremen, Germany, May, 2012.

Critical points of master functions, Université de Nice Mathematics Colloquium, Nice, France, May, 2012.

Arrangements and resonance varieties, Dublin City University Mathematics Colloquium, Dublin, Ireland, February, 2012.

Critical points of products of linear forms, GASC Seminar, Northeastern University Dept. of Mathematics, Boston, MA, October, 2011.

Singular vectors for projective arrangements, Special Session on Algebraic Geometry and Topology of Hyperplane Arrangements, Spring Eastern Section Meeting of AMS, Worcester, MA, April, 2011 (invited 20-minute talk).

Brunnian braids and homomorphisms of arrangement groups, Workshop on Combinatorial and Geometric Aspects of Hyperplane Arrangements, Centro de Ricerca Matematica Ennio di Giorgi, Pisa, Italy, May 24, 2010.

Representations of arrangement groups, Joint Mathematics Meetings, San Francisco, CA, January, 2010.

Applications of tropical geometry to complex hyperplane arrangements, Tropical Seminar, Mathematical Sciences Research Institute, Berkeley, CA, October, 2009.

Vanishing products in Orlik-Solomon algebras, 2nd MSJ Seasonal Institute: Arrangements of Hyperplanes, Hokkaido University, Sapporo, Hokkaido, Japan, August, 2009.

Representations of arrangement groups, Lib60ber: Topology of Algebraic Varieties, Jaca, Aragon, Spain, June, 2009.

On vanishing products in Orlik-Solomon algebras, Conference in Honour of Peter Orlik, Fields Institute, University of Toronto, Toronto, Ontario, Canada, August, 2008.

Arrangement groups and right-angled Artin groups, Special Session on Arrangements and Related Topics, Spring Southeastern Section Meeting of the AMS, Louisiana State University, Baton Rouge, LA, March, 2008.

Resonance and zeros of logarithmic one-forms, Mini-workshop on Topology of Closed One-forms and Cohomology Jumping Loci., Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, August, 2007.

Geometry and combinatorics of resonant weights I and II, CIMPA Summer School on Arrangements, Local Systems, and Singularities, Galatasaray University, Istanbul, Turkey, June, 2007.

Resonance and critical loci of rational functions, Special Session on Arrangements and Configuration spaces, Joint Mathematics Meetings, New Orleans, January, 2007 (invited 20-minute talk).

Critical loci of products of integral powers of linear forms, Special Session on Arrangements and configuration spaces, 1017th Meeting of the AMS, Durham, NH, April, 2006.

Resonance, syzygies, and critical loci, Focused Research Group: Hyperplane Arrangements: Cohomology and Rational Homotopy, Banff International Research Station, Banff, Canada, June, 2005.

Multi-nets, resonant weights, and pencils of curves, Arrangements of Hyperplanes: Algebra, Combinatorics, Geometry, Topology, Centro Stefano Franscini, Ascona, Switzerland, May, 2005.

Some geometry and combinatorics of resonant weights, Combinatorics Seminar, San Francisco State University, December 2004.

Alexander invariants of line arrangements and great circle links, Special Session on Knots and Braids, 1000th Meeting of the AMS, Albuquerque, NM, October, 2004.

Resonance varieties, Introductory Workshop on Hyperplane Arrangements and Applications, Mathematical Sciences Research Institute, Berkeley, CA, August, 2004.

Introduction: The combinatorics and topology of hyperplane arrangements, Introductory Workshop on Hyperplane Arrangements and Applications, Mathematical Sciences Research Institute, Berkeley, CA, August, 2004.

Resonant weights and Hessian pencils, resonance varieties and line complexes, Algebra Seminar, Texas A&M University, College Station, TX, April, 2004.

Resonance in positive characteristic and characteristic varieties of arrangements, Special Session on Geometry and Combinatorics, 2004 AMS-MAA-SIAM Joint Meetings, Phoenix, AZ, January, 2004.

The Hessian arrangement, Mini-Workshop on Combinatorial Stratifications in Geometry and Topology, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, November, 2003.

Projective line complexes and resonance varieties, Special Session on Arrangements in Topology and Algebraic Geometry 984th Meeting of the AMS, Louisiana State University, Baton Rouge, LA, March, 2003.

The line geometry of resonance varieties, Special Session on Arrangements of Hyperplanes, 980th Meeting of the AMS, University of Wisconsin, Madison, WI, October, 2002.

Linearity of resonance components in characteristic p , Special Session on Algebraic Geometry and Combinatorics, 978th Meeting of the AMS, Portland State University, Portland, OR, June, 2002.

Geometry and combinatorics of resonant weights, CBMS Regional Conference: Arrangements and Hypergeometric Functions, Baton Rouge, January, 2002.

Resonance in characteristic p , Mini-workshop on Cohomology Jumping Loci, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany, March, 2002.

Arrangements and matroids determined by their points and lines, Workshop on Arrangements, Forschungsinstitut für Mathematik, ETH Zurich, December 2000.

Resonance varieties and fibered arrangements, Special Session on Arrangements of Hyperplanes, 959th Meeting of the AMS, Columbia University, New York, November, 2000.

Combinatorial and Algebraic Structure in Orlik-Solomon Algebras, Combinatorial Geometries: Oriented Matroids, Matroids, and Applications, C.I.R.M., Marseille-Luminy, France, November 1999.

Line-closed matroids and quadratic algebras, Arrangements in Boston, A Conference on Hyperplane Arrangements, Boston, MA, June, 1999.

Combinatorics of hyperplane arrangements and graded algebras, Université de Bourgogne, Laboratoire de Topologie Colloquium, Dijon, France, May, 1999.

Matroid theory and Knizhnik-Zamolodchikov equations, Combinatorics and Physics '98, LANL, Los Alamos, NM, August, 1998.

Parallel connections, bundles and invariants of arrangements, Workshop on Mathematics Related with Arrangements of Hyperplanes, Tokyo, Japan, July, 1998.

Parallel connections of arrangements, Topology/Combinatorics Seminar, Louisiana State University, Baton Rouge, LA, April, 1998.

OS algebras and Tutte polynomials, Minisymposium on Arrangements of Hyperplanes, UW-Madison Dept. of Mathematics Ph.D. Centennial Conference, May 1997.

Pencils of curves and $K(\pi, 1)$ arrangements—, Special Session of Computational Algebraic Geometry, 103rd Annual Meeting of the AMS, San Diego, January, 1997.

Cohomology and classification of OS algebras, Special session on Arrangements of Hyperplanes, 909th Meeting of the AMS, Iowa City, March, 1996.

Applications of matroid theory to generalized hypergeometric functions, 1995 AMS-IMS-SIAM Joint Summer Research Conference: Matroid Theory, University of Washington, Seattle, July, 1995.

Old and new results on $K(\pi, 1)$ arrangements, Colloque sur les arrangements d'hyperplans, CIRM, Marseille-Luminy, France, July, 1994.

The $K(\pi, 1)$ property for two classes of graphic arrangements, Special session on Graphs and Combinatorics, 888th Meeting of the AMS, Merida, Mexico, December, 1993.

Arrangements and Grassmann strata, Workshop on Arrangements, University of Wisconsin – Madison, October, 1992.

Homotopy invariants of hyperplane arrangements, Mittag-Leffler Institute — Special Year on Combinatorics, Djürsholm, Sweden, February, 1992.

$K(\pi, 1)$ arrangements, Workshop on Arrangements of Hyperplanes, University of Wisconsin – Madison, October, 1991.

The topological theory of arrangements, Cornell University Department of Mathematics, Ithaca, October, 1990.

Order complexes and hyperplane complements, Special Session on Algebraic Combinatorics, International Congress of Mathematicians, Kyoto, Japan, August, 1990.

Combinatorial properties of the Orlik-Solomon algebra, Commutative Algebra and Combinatorics, Nagoya, Japan, August, 1990.

On the classification of hyperplane complements, Algebraic and Analytic Geometry, Tokyo, Japan, August, 1990.

The cohomology and fundamental group of a complement of hyperplanes, Iowa City Conference on Singularities, Iowa City, July, 1986.

Grant Support

Fulbright U.S Scholar Grant, U.S. and Irish Fulbright Commissions and Center for International Exchange of Scholars, €13,000 to conduct research at Dublin City University, Dublin, Ireland, January - April, 2012.

Guest Scholar Program, Max-Planck Institute for Mathematics, €7,200 euro, Bonn, Germany, October 6 - November 19, 2011 and April 29 - May 19, 2012.

CURM mini-grant, Center for Undergraduate Research in Mathematics, Brigham Young University and NSF, \$19,850 for student wage, travel, and one course teaching release.

The homotopy theory of arrangements (RUI), National Science Foundation, 7/1/92 - 6/30/94, \$4,900 (equipment only).

The homotopy theory of arrangements (RUI), National Science Foundation, 6/1/90 - 5/31/92, \$16,200.

NSF-CBMS Regional Research Conference in the Mathematical Sciences : Arrangements of Hyperplanes, Flagstaff, AZ, June 6-10, 1988, National Science Foundation, 1/1/87 - 12/31/87, \$24,928.

NAU Organized Research Program, summer salary support 1987-1990, 1992-1995, 1996-1997, 2006-07.

M.S. Theses directed

Thomas Holtzworth, *Highest Weight Classification of the Irreducible Representations of the Special Unitary Group*, 2016.

Benjamin Helford, *Combinatorial Properties of Complex Hyperplane Arrangements*, 2006.

Dana Ernst, *Cell Complexes for Arrangements with Group Actions*, 2000.

Viswanath Kalambur, *Application of Diagrammatic Methods to Line Arrangements*, 1997.

Harold Rogers, *Combinatorial Properties of the Möbius Function and Characteristic Polynomial in Hyperplane Arrangements*, 1994.

Raymond Vought, *The Double Impossibility of $\zeta(3)$* , 1992.

Other:

Editorial Board, *Mathematics*, 2012 - present.

Editorial Board, *Advances in Applied Mathematics* (Elsevier), 2010 - present.

Editorial Board, *JP Journal of Geometry and Topology* (Pushpa), 2003 - present.

Organizing Committee, Arrangements and Configuration Spaces, Universität Bremen, Bremen, Germany, May 23-25, 2012.

Organizing Committee, Hyperplane Arrangements and Applications, A conference in honour of Hiroaki Terao, Pacific Institute of Mathematical Sciences, University of British Columbia, Vancouver, BC, August 8-12, 2011.

Chair of Organizing Committee, MSRI Workshop on Recent Developments in Arrangements and Configuration Spaces, Mathematical Sciences Research Institute, Berkeley, August 7-11, 2006.

Organizing Committee, MSRI Program on Hyperplane Arrangements and Applications, Mathematical Sciences Research Institute, Berkeley, Fall, 2004.

Organizing Committee, MSRI Introductory Workshop on Hyperplane Arrangements and Applications, MSRI, August 23-27, 2004.

Chair of Organizing Committee, MSRI Workshop on Topology of Arrangements and Applications, October 4-8, 2004.

Organizing Committee and Lecturer, MSRI Summer Graduate School on Hyperplane Arrangements and Applications, University of Oregon, August 2-13, 2004.

Referee for *Advances in Mathematics*, *American Mathematical Monthly*, *Mathematics Research Letters*, *Annals of Combinatorics*, *Compositio Mathematica*, *Geometriae Dedicata*, *European Journal of Combinatorics*, *Transactions of the American Mathematical Society*, *Journal of Algebraic Combinatorics*, *Advances in Mathematics*, *Duke Mathematical Journal*, *Topology and Its Applications*, *Journal of Pure and Applied Algebra*, *Journal of Computational and Applied Mathematics*, *Linear and Multilinear Algebra*, *Discrete and Computational Geometry*, *Boletín de la Sociedad Matemática Mexicana*, *Annali della Scuola Normale Superiore Classe di Scienze*, AMS *Contemporary Mathematics* series.

External reviewer of grant and promotion applications for Ergebnisse Technische Hochschule Zurich, Northeastern University, University of Kansas, City University of New York, National Science Foundation.

Reviewer for *Zentralblatt für Mathematik* and *Mathematical Reviews*, with over fifty published reviews.

Organizer or co-organizer of ten conferences and/or workshops on hyperplane arrangements and related topics.

directed 9 projects, involving 14 students, under the NSF *Research Experiences for Undergraduates* program at NAU.

mentored two students in NASA Space Sciences grant-funded undergraduate research during the 2008-09 academic year at NAU.

mentored four students in undergraduate research under an NSF-funded Center for Undergraduate Research in Mathematics mini-grant during the 2010-11 academic year.

Awards :

Chairman's Award for Research, NAU Dept. of Mathematics and Statistics, 2010-11.

Recognition as most influential instructor of Gold Axe Award recipient (Crystal (Diaz) Graziano), 2008.

Chairman's Award for Research, NAU Dept. of Mathematics, 2002-03.

Honorary Inductee, Golden Key National Honor Society, 1994.

Chairman's Award for Research, NAU Dept. of Mathematics, 1990-91.

Chairman's Award for Research, NAU Dept. of Mathematics, 1986-87.

Professional memberships :

American Mathematical Society.