

CURRICULUM VITAE for KARIN MELNICK

Professor
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PERSONAL INFORMATION

Education

University of Chicago	Mathematics	Ph.D. 2006	Advisor Benson Farb
University of Chicago	Mathematics	M.S. 2000	
Reed College	Mathematics	B.A. 1999	

Employment

- Department of Mathematics, University of Maryland, College Park: Assistant Professor, 2009–2014; Associate Professor 2014–2021; Professor and Associate Chair for Faculty Affairs 2021–*present*
- Department of Mathematics, Yale University, New Haven, CT: Gibbs Assistant Professor, 2006–2009
- Stafford Trading, Chicago, IL: Quantitative Analyst, December 2000–August 2001
- Bell Labs, Murray Hill, NJ: Senior Technical Associate, Summer 1999, Summer 2000

Visiting Positions

- Max-Planck-Institut für Mathematik, January–March 2016; September 2018–July 2019
- Universität Heidelberg, Gastprofessorin, January–May 2017
- Université de Strasbourg, Professeur Invitée, April–May 2016
- Mathematical Sciences Research Institute, Research Member, January–March 2015
- University of Chicago, February–March 2013
- Institut Henri Poincaré, February–March 2012
- Australian National University, January 2012, February 2014
- Erwin Schrödinger Institut, April–June 2009
- Department of Mathematics, University of Maryland, College Park, Summer 2006
- École Normale Supérieure de Lyon, May 2005, December 2005

Language Skills: Fluent in spoken and written German and French.

RESEARCH AND SCHOLARLY ACTIVITIES

Articles in Refereed Journals:

1. K. Melnick, V. Pecastaing: The conformal group of a compact, simply connected Lorentzian manifold, *Journal of the American Mathematical Society* **35** no. 1 (2022) 81–122.
2. K. Melnick: Rigidity of transformation groups in differential geometry, *Notices of the American Mathematical Society* **68** no. 5 (2021) 721–732.
3. A. Čap, K. Melnick: C^1 deformations of almost-Grassmannian structures with strongly essential symmetry (24 pp), posted at arxiv.org/abs/1902.01801, to appear in *Transformation Groups*.
4. C. Frances and K. Melnick: Topology of automorphism groups of parabolic geometries, *Geometry & Topology* **23** (2019), no. 1, 135-169.
5. K. Melnick: Nonstationary smooth geometric structures for contracting measurable cocycles, *Ergodic Theory and Dynamical Systems* **39** no. 2 (2019) 392-424; published online in 2017 at <https://doi.org/10.1017/etds.2017.38>.
6. K. Melnick, K. Neusser: Strongly essential flows on irreducible parabolic geometries, *Transactions of the American Mathematical Society* **368** no. 11 (2016) 8079-8110.
7. S. Dumitrescu, K. Melnick: Quasihomogeneous three-dimensional real-analytic Lorentz metrics do not exist, *Geometriae Dedicata* **179** no. 1 (2015) 229-253
8. A. Čap, K. Melnick: Essential Killing fields of parabolic geometries: projective and conformal structures, *Central European Journal of Mathematics* **11** no. 12 (2013) 2053-2061.
9. A. Čap, K. Melnick: Essential Killing fields of parabolic geometries, *Indiana University Mathematics Journal* **62** no. 6 (2013) 1917-1953.
10. C. Frances, K. Melnick: Formes normales pour les champs conformes pseudo-riemanniens [Normal forms for conformal pseudo-Riemannian vector fields], *Bulletin de la Société Mathématique de France* **141** no. 3 (2013) 377-421.
11. K. Melnick: A Frobenius theorem for Cartan geometries, with applications, *L'Enseignement Mathématique (Sér. II)* **57** no. 1-2 (2011) 57-89.
12. C. Frances, K. Melnick: Nilpotent groups of conformal flows on compact pseudo-Riemannian manifolds, *Duke Mathematical Journal* **153** no. 3 (2010) 511-550.
13. U. Bader, C. Frances, K. Melnick: An embedding theorem for automorphism groups of Cartan geometries, *Geometric and Functional Analysis* **19** no. 2 (2009) 333-355.
14. K. Melnick: Compact Lorentz manifolds with local symmetry (dissertation), *Journal of Differential Geometry* **81** no. 2 (2009) 355-390.
15. T. Barbot, V. Charette, T. Drumm, W. Goldman, K. Melnick: A primer on the $(2 + 1)$ -Einstein universe, in *Recent developments in pseudo-Riemannian Geometry: Proceedings of the special semester*, “Geometry of pseudo-Riemannian manifolds with

applications to physics,” Erwin Schrödinger Institute, Vienna, September - December 2005 (eds. D. Alekseevsky and H. Baum) Vienna: European Mathematical Society (2008) 179-229.

16. M. Deffaf, K. Melnick, A. Zeghib: Nonproper isometric actions of semisimple groups on Lorentz manifolds, *Geometric and Functional Analysis* **18** no. 2 (2008) 463-488.
17. K. Melnick: Isometric actions of Heisenberg groups on compact Lorentz manifolds, *Geometriae Dedicata* **126** no. 1 (2007) 131-154.

Chapters in Books: *This paper was refereed.*

- K. Melnick: Dynamique sur les variétés lorentziennes [Dynamics on Lorentzian manifolds] (trans. D. Smaï), in *Algèbre, dynamique, et analyse pour la géométrie: Actes des Écoles de Géométrie et Dynamique au Maghreb 2004-2007* (eds. T. Barbot, H. Belbachir, S. Mehdi, D. Smaï, and R. Souam) Paris: Ellipses (2010) 307-342.

Preprints:

- C. Frances and K. Melnick: The Lorentzian Lichnerowicz Conjecture for real-analytic, 3-dimensional manifolds (41 pp.) arxiv.org/abs/2108.07215.

Grants

- National Science Foundation Individual Research Grant: 2021–2024.
- National Science Foundation CAREER Grant, 2013–2018 (*extended to 2020*).
- National Science Foundation REU Grant: Mathematics, Applied Mathematics, and Statistics Research Experience for Undergraduates, 2014-2016; Kasso Okoudjou was the Principal Investigator, and I was one of 15 Senior Personnel.
- National Science Foundation Grant for Participant Support: Workshop on Cartan Connections, Geometry of Homogeneous Spaces, and Dynamics, 2011 (*extended to 2013*).
- National Science Foundation Individual Research Grant: 2010-2013 (*extended to 2014*).

Fellowships and Honors

- Joan and Joseph Birman Fellowship for Women Scholars: “seeks to address the paucity of women at the highest levels of research in mathematics by giving exceptionally talented women extra research support during their mid-career years,” 1 fellowship per year, awarded for 2020–2021.
- American Mathematical Society Centennial Fellowship: “award[ed] annually to outstanding mathematicians to help further their careers in research,” 0-2 fellowships per year, held 2013–2014.
- Erwin Schrödinger Institut Junior Research Fellowship: April–June 2009

- National Science Foundation Postdoctoral Research Fellowship, mentor Gregory Margulis, 2006–2009.
- National Science Foundation International Research Fellowship: *declined*, 2006
- National Science Foundation Graduate Research Fellowship Program honorable mention: 1999, 2000
- Phi Beta Kappa (national honor society): Beta of Oregon, May 1999

Talks

Colloquia, Named Lectures, and Invited Conference Talks

- Virginia Topology Conference, Charlottesville, November 2021
- George Mason University: Colloquium, February 2020
- Abel Symposium: Ålesund, Norway, June 2019
- Universität Duisburg-Essen: Colloquium, July 2018
- No Boundaries, in honor of Benson Farb’s 50th Birthday, Chicago, IL, October 2017
- Graduiertenkolleg “Asymptotic Invariants and Limits of Groups and Spaces” Colloquium, Universität Heidelberg, February 2017
- Wesleyan University: Colloquium, December 2016
- Geometries, surfaces and representations of fundamental groups, in honor of William Goldman’s 60th Birthday, College Park, MD, June 2016
- Friedrich-Schiller-Universität Jena: Colloquium, May 2015
- Smoky Great Plains Geometry Workshop, Wichita, KS, March 2015
- Australian National University: Colloquium, February 2014
- University of Illinois, Chicago: Colloquium, February 2014
- Winter School in Geometry and Physics, Srní, Czech Republic: Plenary lecturer, January 2014
- University of Wisconsin: Colloquium, January 2014
- University of Chicago: Department/AWM Colloquium, March 2013
- Evans Lectures, Cornell University, January 2013
- Discrete Groups and Geometric Structures, with Applications, Oostende, Belgium: Plenary lecturer, June 2011
- Howard University: Colloquium, November 2010
- Texas Geometry and Topology Conference, Houston, TX, November 2009
- Analysis and Geometry of Pseudo-Riemannian Manifolds, Greifswald, Germany, July 2009

- In Honor of Bob Zimmer’s 60th Birthday, Chicago, IL, September 2007
- Bloomington Geometry Workshop, Bloomington, IN, April 2006
- Reed College: Mathematics Colloquium, April 2006

Invited Seminar Talks and Regular Conference Talks since 2020

- University of Maryland: Dynamics Seminar, December 2021
- University of Maryland: Geometry-Topology Seminar, November 2021
- SCREAM Project Opening Workshop, Ilawa, Poland/Online, August 2021
- Westfälische Wilhelms-Universität Münster: Oberseminar Differentialgeometrie (Online), June 2020
- University of Maryland: RIT on Mathematical Concepts and Practices (Online), March 2021.
- Friedrich-Schiller-Universität Jena: Analysis & Geometry/Dynamical Systems & Mathematical Physics Seminar (Online), November 2020.
- Midwest Dynamics and Group Actions seminar (Online), June 2020

Expository Lecture Series

- Graduiertenkolleg “Asymptotic Invariants and Limits of Groups and Spaces”, Universität Heidelberg/Karlsruher Institut für Technologie: Lecturer in mini-course on “Parabolic Geometries,” April–May 2017
- GEAR Junior Retreat, Urbana-Champaign, IL: Lecturer on “ (G, X) -structures,” July–August 2012
- Summer school for women on Examples of Group Actions, Columbus, OH: Lecturer on “Ergodic theory and algebraic hulls,” May–June 2010
- École de Géométrie Différentielle et Systèmes Dynamiques, Oran, Algeria: Lecturer on “Dynamics on Lorentz manifolds” in French and English, November 2006

TEACHING, MENTORING, AND ADVISING

Undergraduate Courses taught since Ph.D.

- University of Maryland, College Park:
Introduction to Mathematical Proof, Spring 2022
Euclidean and non-Euclidean Geometry, Fall 2021 (24 students), Fall 2019 (16 students), Fall 2016 (11 students), Fall 2011 (30 students), and Spring 2010 (34 students)
Honors Multivariable Calculus (Math 340), Fall 2014 (30 students)
Differential Geometry of Curves and Surfaces, Fall 2014 (7 students)
Calculus II for the Life Sciences, Fall 2012 (100 students) and Fall 2013 (96 students)
Calculus I, Fall 2010 (142 students)

- Yale University, New Haven, CT:
Undergraduate Independent Study, Spring 2009 (1 student)
Ordinary Differential Equations, Fall 2007 (20 students)
Multivariable Calculus, Fall 2007 (30 students)

Graduate Courses taught since Ph.D.

- University of Maryland, College Park:
Foundations of Topology, Fall 2021 (13 students)
Foundations of Differential Geometry, Spring 2021 (14 students)
Exterior Differential Systems, Spring 2020 (6 students)
Geometric Analysis, Fall 2019 (9 students)
Lie Groups, Fall 2016 (15 students)
Lorentzian Differential Geometry, Fall 2013 (7 students)
Algebraic Topology, Spring 2011 (9 students)
Riemannian Geometry, Fall 2011 (10 students), Fall 2009 (12 students)
- Yale University, New Haven, CT:
Automorphisms of Geometric Structures, Spring 2009 (5 students)
Introduction to Differential Geometry, Fall 2008 (15 students)

Research Advising

- Advisor for doctoral student Nakyoung (Rachel) Lee, November 2020–*present*. She is studying closed, conformally flat, 3-dimensional Lorentzian manifolds.
- Advisor for pre-candidacy doctoral student Spyridon Lentas, Spring 2021–*present*. He is studying conformal and projective compactifications of semi-Riemannian manifolds.
- Advisor for pre-candidacy doctoral student Geoffrey Sangston, Fall 2021–*present*.
- Advisor for doctoral student Tianyu Ma, Fall 2013–Summer 2018. His dissertation was on local and global rigidity of projective structures arising from Riemannian or Lorentzian metrics. He successfully defended his thesis in May 2018 and subsequently held a three-year postdoctoral position at Friedrich-Schiller-Universität Jena.
- Advisor for postdoctoral visitor Vincent Pecastaing, Fall 2016. A substantial paper, now accepted, eventually resulted from a joint project initiated during this visit.
- Leader of module on “Local isometries of three-dimensional spacetimes” in MAPS-REU (Mathematics, Applied Mathematics, and Statistics Research Experience for Undergraduates), University of Maryland, Summer 2015.
- Advisor on summer research project for graduate student Jean-Philippe Burelle, Summer 2013. He studied scalar invariants of Riemannian and Lorentzian metrics and wrote Mathematica scripts to compute some.

Advising Student Groups

- Faculty advisor for Directed Reading Program, University of Maryland, 2011–2015
- Faculty advisor for Women in Math Club, University of Maryland, 2013–2015

- Leader of Lang Lunch discussions with graduate student teachers, Yale University, 2009

Extension Activities

- Fulbright Foundation: Host of scholar Dr. Richard Boadi from the Kwame Nkrumah University of Science and Technology, Ghana, *planned for January–June 2022*.
- Women in Math Club, University of Maryland: π day talk, March 2014
- Nebraska Conference for Undergraduate Women in Mathematics: Panelist, January–February 2014
- Mu Alpha Theta Math Honor Society, Winston Churchill High School, Potomac, MD: Guest lecturer, November 2013
- Writing Workshop for mathematics graduate students, University of Maryland: Founder and director, Spring 2011, 2012, and 2013, Fall 2014
- Seminars for Elementary Specialists and Mathematics Educators, Chicago, IL: Instructor in *Geometry* for Chicago Public Schools teachers, Fall 2004
- Directed Reading Program, University of Chicago: Founding member of steering committee, 2002–2003

PROFESSIONAL SERVICE

Editorships

- Editor for *Forum Mathematicum*, 2021–present.
- Editor for *European Journal of Mathematics*, 2014–present.
- Editor for *Central European Journal of Mathematics*, 2013–2014.
- Guest editor for *Central European Journal of Mathematics*, special issue on “Finite dimensional integrable systems, dynamics, and Lie theoretic methods in geometry and mathematical physics,” appeared October 2012

Fellowship, Grant and other External Reviewing

- AMS Centennial Fellowship Committee: 2015, Chair in 2016
- Fonds National de la Recherche Luxembourg: external reviewer for AFR postdoctoral grant (Aide à la Formation-Recherche), 2014
- Ireland: external reviewer for university promotion case, 2013
- National Science Foundation Panelist: reviewing research grant applications, 2011

Conference Reviewing

- Judge of graduate student research posters for Association for Women in Mathematics Poster Competition at AMS-MAA Joint Meetings (Online), January 2021

Peer Reviewing

- Referee for *Advances in Geometry*, *Advances in Mathematics*, *American Journal of Mathematics*, *Annals of Mathematics*, *Annales de l'Institut Fourier*, *Annales Scientifiques de l'École Normale Supérieure*, *Directions for Mathematics Research Experiences for Undergraduates* (World Scientific, 2016), *Geometriae Dedicata* (8 articles), *Geometric and Functional Analysis* (2 articles), *Journal of Differential Geometry* (2 articles), *Journal of Modern Dynamics*, *New York Journal of Mathematics*, *Proceedings of the American Mathematical Society* (2 articles), *Proceedings of the London Mathematical Society*, *Publicacions Matemàtiques*, *SIGMA (Symmetry, Integrability and Geometry: Methods and Applications)*, *Transactions of the American Mathematical Society* (4 articles), *Transformation Groups*, *Wiley Interdisciplinary Reviews*
- Author of 13 reviews for the AMS' MathSciNet

Conference Organizing

- Co-organizer, *Conference on Geometric Structures, Compactifications, and Group Actions*, Université de Strasbourg, planned for July 2020, postponed to July 2022
- Co-organizer, *Connections for Women: Dynamics on Moduli Spaces of Geometric Structures*, Mathematical Sciences Research Institute, January 2015
- Co-organizer, Special Session on Differential Geometry and Mathematical Physics, *American Mathematical Society Northeastern Sectional Meeting*, Halifax, NS, Canada, October 2014
- Co-organizer, *GEAR Senior Retreat*, University of Maryland, March 2014
- Co-organizer, *Workshop on Cartan Connections, Geometry of Homogeneous Spaces, and Dynamics*, Erwin Schrödinger Institut, July 2011
- Co-organizer, Special Session on Conformally Flat Lorentz Manifolds, *American Mathematical Society-Mathematical Association of America Joint Meetings*, San Diego, CA, January 2008

Campus (all at University of Maryland)

- Associate Chair for Faculty Affairs, Mathematics Department, Fall 2021–Spring 2023
- Founding organizer of AWM (Association for Women in Mathematics) Distinguished Colloquium Series, Spring 2021
- Member of the following committees in the Department of Mathematics:
 - Tenure Committee for Daniel Cristofaro-Gardiner (Fall 2021–Spring 2022)
 - Graduate Admissions Committee (Spring 2021, Spring 2022)
 - Hiring Committee (Fall 2014, Fall 2019–Spring 2020)
 - Postdoctoral Hiring Committee (Fall 2016)
 - Chair Search Committee (Fall 2012)
 - Policy Committee (Fall 2010– Spring 2011, Fall 2020–Spring 2021)

– Merit Pay Committee (Spring 2011)

- Co-organizer of Geometry-Topology Seminar, 2009–2014, 2019–2020
- Judge of graduate student presentations for campus-wide Graduate Research Interaction Day (GRID), April 2013

Community

- Democrats Abroad Germany, Düsseldorf-Ruhr Chapter: Phonebanker promoting turnout of US voters abroad, 2018
- Reed College Alumni Association, Washington, DC, Chapter: Member of Steering Committee, 2011–2014
- District of Columbia Earned Income Tax Credit Campaign, Washington, DC: Volunteer tax preparer for low-income residents, January–April 2010