

Kirsten Graham Wickelgren

Curriculum Vitae

Education

- **Stanford University**, Stanford, California.
Ph.D. in mathematics 2009.
Thesis: *Lower central series obstructions to homotopy sections of curves over number fields*.
Advisor: Gunnar Carlsson.
- **L'École Normale Supérieure**, Paris, France.
Titre d'Ancienne Élève de l'École Normale Supérieure 2004.
- **Harvard University**, Cambridge, Massachusetts.
A.B.-A.M. magna cum laude 2003 A.M. in mathematics.

Languages

- English, first language.
- French, quite good.

Research interests

Algebraic topology, algebraic geometry, and number theory. Homotopy theory and arithmetic geometry. \mathbb{A}^1 -homotopy theory, motives, K-theory, equivariant homotopy theory, Grothendieck's anabelian program.

Employment

- **Professor**, Duke University, 2019–present.
- **Associate Professor**, Georgia Institute of Technology, 2018–2019.
- **Assistant Professor**, Georgia Institute of Technology, 2013–2018.
- **American Institute of Math 5-year Fellow**, Harvard University, 2009–2013.

Research Publications and Preprints

Up-to-date information can be found under papers at <https://services.math.duke.edu/~kgw/>.

1. *On quadratically enriched excess and residual intersections*, with Tom Bachmann, ArXiv and submitted, 2021.
2. *Applications to A1-enumerative geometry of the A1-degree*, with Sabrina Pauli, Res. Math. Sci. 8 (2021), no. 2, 24, special volume Arithmetic Topology.
3. *Compactly Supported A1-Euler Characteristic and the Hochschild Complex* with Niny Arcila-Maya, Candace Bethea, Morgan Opie, and Inna Zakharevich accepted for publication in Proceedings of Women in Topology III, 2021.
4. *A1-Euler Classes: Six Functors Formalisms, Dualities, Integrality and Linear Subspaces of Complete Intersections*, with Tom Bachmann, accepted for publication in the Journal of the Institute of Mathematics of Jussieu, 2021.
5. *Examples of wild ramification in an enriched Riemann–Hurwitz formula* with Candace Bethea and Jesse Kass, Motivic homotopy theory and refined enumerative geometry, 69-82, Contemp. Math., 745, Amer. Math. Soc., Providence, RI, 2020
6. *An Arithmetic Count of the Lines Meeting Four Lines in \mathbb{P}^3* with Padmavathi Srinivasan, and with an appendix by Borys Kadets, Padmavathi Srinivasan, Ashvin A. Swaminathan, Libby Taylor, and Dennis Tseng An, Trans. Amer. Math. Soc. 374 (2021), no. 5, 3427–3451.
7. *The Galois Action on the Lower Central Series of the Fundamental Group of the Fermat Curve* with Rachel Davis, and Rachel Pries, arXiv and submitted, 2018.
8. *Operad Structure on π_1 -sections of Conf_n* , with Craig Westerland, Oberwolfach Report 1816a, preliminary version available at https://www.mfo.de/occasion/1816a/www_view, workshop April 15-21, 2018.
9. *An Arithmetic Count of the Lines on a Smooth Cubic Surface* with Jesse Kass, Compos. Math. 157 (2021), no. 4, 677-709.
10. *An Étale Realization Functor Which Does Not Exist* with Jesse Kass, New Directions in Homotopy Theory, proceedings of the second Mid-Atlantic Topology Conference, edited by N. Kitchloo, M. Merling, J. Morava, E. Riehl, W.S. Wilson, Contemporary Mathematics, Volume 707, p.11-31, 2018.
11. *The Galois Action and Cohomology of a Relative Homology Group of Fermat Curves*, with Rachel Davis, Rachel Pries, and Vesna Stojanoska, J. Algebra 505, 2018, 33–69.
12. *The Class of Eisenbud – Khimshiashvili – Levine is the Local A1-Brouwer Degree*, with Jesse Kass, Duke Mathematical Journal, Vol. 168, No. 3 429–469, 2019.
13. *\mathbb{A}^1 -Milnor Number*, with Jesse Kass, Oberwolfach Report 35(2016), 19 August, 2016.
14. *Classification of Problematic Subgroups of $U(n)$* with Julie E. Bergner, Ruth Joachimi, Kathryn Lesh, and Vesna Stojanoska, Trans. Amer. Math. Soc. 371 (2019), no. 10, 6739-6777.
15. *Massey Products $\langle y, x, x, \dots, x, x, y \rangle$ in Galois Cohomology via Rational Points*, Journal of Pure and Applied Algebra, Volume 221, Issue 7, July 2017, pages 1845-1866.
16. *A Classical Proof that the Algebraic Homotopy Class of a Rational Function is the Residue Pairing* with Jesse Kass, Linear Algebra and Its Applications 595 (2020) 157–181.
17. *The Simplicial Suspension Sequence in \mathbb{A}^1 -homotopy*, with Aravind Asok and Ben Williams, Geometry & Topology 21-4 (2017), 2093–2160.

18. *Desuspensions of $S^1 \wedge \mathbb{P}_{\mathbb{Q}}^1 - \{0, 1, \infty\}$* , International Journal of Mathematics, June 2016, Vol. 27, No. 07.
19. *The Simplicial EHP Sequence in \mathbf{A}^1 -Algebraic Topology*, with Ben Williams, Geometry & Topology 23-4 (2019), 1691–1777. DOI 10.2140/gt.2019.23.1691
20. *Splitting Varieties for Triple Massey Products*, with Michael J. Hopkins, Journal of Pure and Applied Algebra 219 (2015), pp. 1304-1319.
21. *An Abel map to the compactified Picard scheme realizes Poincaré duality*, with Jesse Kass, Algebraic & Geometric Topology 15-1 (2015), 319–369.
22. *Fixed points of p -toral groups acting on partition complexes* with Julie E. Bergner, Ruth Joachimi, Kathryn Lesh, and Vesna Stojanoska, Contemporary Math. 641 Women in Topology: Collaborations in Homotopy Theory, AMS, 2015.
23. *2-Nilpotent Real Section Conjecture*, Mathematische Annalen: Vol. 358, Issue 1 (2014), pp. 361-387.
24. *Cartier’s first theorem for Witt vectors on $\mathbb{Z}_{\geq 0}^n$* , Algebraic Topology: Applications and New Directions, Stanford Symposium 2012, Ulrike Tillmann, Soren Galatius, Dev Sinha editors, Contemporary Mathematics 620, AMS, 2014.
25. *n -Nilpotent obstructions to π_1 -sections of $\mathbf{P}^1 - \{0, 1, \infty\}$ and Massey products*, Advanced Studies in Pure Mathematics 63, 2012, Proceedings for Conferences in Kyoto, pp 579-600.
26. *Universal Covering Spaces and Fundamental Groups in Algebraic Geometry as Schemes*, with Ravi Vakil, Journal de Théorie des Nombres de Bordeaux, 23 no. 2 (2011), p.489-526.

Expository Publications and Preprints

1. *An Explicit Self-Duality*, with Nikolas Kuhn, Devlin Mallory, Vaidehee Thatte. Accepted for publication in the proceedings of the Stacks Project workshop online SPONGE, 2021.
2. *Unstable Motivic Homotopy Theory*, with Ben Williams, chapter of the Handbook of Homotopy Theory, edited by Haynes Miller, CRC Press, 2020.
3. *An Arithmetic Count of the Lines on a Smooth Cubic Surface*, expository article on joint work with Jesse Kass, Notices Amer. Math. Soc. 65 (2018), no. 4, 404-405.
4. *What is an anabelian scheme?* Notices of the AMS, March 2016, Volume 63 No 3, p. 285-286.
5. *Grothendieck’s Anabelian Conjectures*, The Harvard College Mathematics Review, Faculty Feature Article, Vol. 5, 2013, p. 77-83.

Grants

- NSF DMS-2103838 *Motivic Homotopy Theory and Applications to Enumerative Geometry*, 2021-2024.
- co-PI NSF DMS-1745583 *RTG: Georgia Tech Geometry and Topology*, 2017-2022.
- NSF DMS-1552730, then 2001890 *CAREER: Etale and Motivic Homotopy Theory and Applications to Arithmetic Geometry*, 2016-2021. Extended to 2022.

- NSF DMS-1406380 *Homotopy Theory of Schemes, Grothendieck's Anabelian Program, and Rational Points*, 2014-2017.

Academic Honors

- American Institute of Mathematics 5-year Fellowship: 2009
- Stanford Graduate Research Fellowship: 2003
- National Science Foundation Graduate Research Fellowship: 2003
- Harvard-École Normale Supérieure Exchange Fellowship: 2003
- Phi Beta Kappa (Harvard University): 2002
- John Harvard Scholarship (Harvard University): 2001, 2002
- Detur Prize (Harvard University): 2000
- Intel Science Talent Search Finalist (formerly Westinghouse Science Talent Search): 1999.
Paper: *Re-calculation of the deflection of light by the sun based on an equation from string theory.*
Advisor: Brian Greene.

Editorial work

- Editor, Journal of Topology, LMS.
- Editor, New York Journal of Mathematics.
- Editor, Annals of K-theory.

PhD students

- Cameron Darwin, Duke University.
- Thomas Brazelton, co-advising with Mona Merling, University of Pennsylvania.
- Stephen McKean, Duke University.
- Sabrina Pauli, Ph.D. 2020 University of Oslo, co-advised with Paul Arne Østvær.

Undergraduate research mentoring

- REU Mentor to Marie Bennett, research project on Euler characteristic transforms, co-advised with Sayan Mukherjee, REU supported by NSF DMS-2103838 Summer 2021.
- REU Mentor to John Igieobo, Steven Sanchez, and Dae'Shawn Taylor, research project on unstable \mathbb{A}^1 -Euler classes, REU supported by NSF DMS-2001890, Summer 2020.

- REU Mentor to Brandon Boggess, Research project on splitting varieties, supported by an REU supplement to NSF DMS-1406380, Summer 2015. Brandon Boggess's paper on this work *Splitting Varieties for Cup Products with $\mathbb{Z}/3$ -Coefficients* has been published in the Journal of Number Theory, 169C (2016), 388-405.

High school mathematics research mentoring and instruction

- **Mathematics Employment Experience for High School Students**, ongoing and July 6-9, 2021, June 15-19, 2020 at Duke University, and June 3-7 2019, June 11-15 2018 and July 10-14 2017 at Georgia Institute of Technology. <https://services.math.duke.edu/~kgw/MEEHSS-web-page/MEEHSS.html>
- **Mathcamp**, visiting scholar, July 3-7, 2012.
- **PROMYS** program in mathematics for young scientists. Mentor 2012. Project on random involutions.
- **PROMYS** program in mathematics for young scientists. Mentor 2010. Project on real algebraic curves.

Colloquia and invited addresses

- 2/2/22, Colloquium, Rutgers University (virtual), NJ, USA.
- 12/8/21, Colloquium, University of Pennsylvania, PA, USA.
- 11/18/21 Joint Colloquium Brandeis–Harvard–MIT–Northeastern (virtual), MA, USA.
- 5/10/21, Pitt Colloquium (virtual) *Rational Points and Galois Representations*, University of Pittsburgh, USA.
- 4/8/21, Colloquium (virtual), University of Nevada, Reno, USA.
- 12/2/20, Colloquium (virtual), University of Utah, USA.
- 11/19/20, Colloquium (virtual), Reed College, OR USA.
- 11/12/20, Colloquium (virtual), Vanderbilt University, TN USA.
- 10/1/20, Colloquium (virtual), University of Virginia, VA USA.
- 5/22/20, Colloquium (virtual), Warwick, UK.
- 11/21/19, Colloquium, Berkeley, CA USA.
- 10/4/19, Colloquium, University of Chicago, IL USA.
- 1/24/19, Colloquium, Brown University, RI USA.
- 1/23/19, Colloquium, Northeastern University, MA USA.
- 1/17/19, Colloquium, UCLA, CA USA.
- 11/27/19, Colloquium, University of Notre Dame, IN USA.
- 4/15/18, AMS South-East Sectional Invited Address, Vanderbilt, Nashville, TN.
- 3/1/13, Colloquium, University of Wisconsin.
- 3/1/12, Colloquium, Emory.
- 12/6/11, Colloquium, Emory.
- 11/19/10, Colloquium, Case Western Reserve.

Conference and seminar talks, and workshop minicourses

- 7/12-16/21, *Park City Math Institute Graduate School Summer School Motivic Homotopy and Applications*, (Virtual), Utah, USA.
- 6/9/21, Motivic Geometry Seminar, *Center for Advanced Study* (virtual) Oslo, Norway.
- 5/6/21, IMJ-PRJ Enumerative Geometry Seminar, (virtual) Paris, France.
- 3/22/21, MIT Topology Seminar, Cambridge Mass, USA.
- 1/14/21, IST Algebraic Geometry and Number Theory seminar (virtual), Austria.
- 8/31/20-9/2/20, ICERM hot topics: Monodromy and Galois groups in enumerative geometry and applications (virtual), RI, USA.
- 6/6/20-6/25/20, IHES 2020 summer school : Motivic, Equivariant, and Non-commutative, Homotopy Theory (virtual), France.
- 4/24/20, Stanford Algebraic Geometry seminar (virtual), CA, USA.
- 2/19/20, Cambridge Differential Geometry and Topology seminar, Cambridge, UK.
- 1/9/20-1/10/20, Simons collaboration on Arithmetic Geometry, Number Theory, and Computation, Annual Meeting, NYC, USA.
- 11/9/19-11/10/19, Texas Geometry and Topology workshop, College Station, TX, USA.
- 10/29/19, BC-MIT number theory seminar, Cambridge, MA, USA.
- 9/15/20-9/21/19, minicourse, Calculations in motivic homotopy theory, Regensburg, Germany.
- 6/23/19-6/29/19, MFO K-theory, Oberwolfach, Germany.
- 6/10/19-6/14/19, minicourse, Arithmetic Topology, Pacific Institute of Math, UBC, Canada.
- 5/6/19-5/10/19, Algebro-geometric and Homotopical Methods, Institute Mittag-Leffler, Sweden.
- 4/13/19, Shanks Homotopy Theory, Vanderbilt University, TN USA.
- 3/25-29/19, MSRI: Derived Algebraic Geometry and Applications, Berkeley CA.
- 3/2-6/19, lecturer, Arizona Winter School: interactions between algebraic topology and arithmetic geometry, University of Arizona.
- 1/28/19, Arithmetic Geometry Seminar, Berkeley, CA USA.
- 9/4/18, Math Department Talk, Duke University, NC USA.
- 8/17/18, Motivic Homotopy Theory, Newton Institute, Cambridge UK.
- 7/9-13/18, Homotopy Theory and Arithmetic Geometry, Imperial College London.
- 6/28/18, Motivic Homotopy of Spheres, Freie Universitaet Berlin.
- 6/18/18, Motivic Enumerative Geometry, Essen.
- 3/20/18, MSRI: Structures in Enumerative Geometry, Berkeley, CA.
- 3/7/18, Seminar for Women in Math in Atlanta, Georgia Tech.
- 2/28/18, Topology Seminar, University of Chicago.
- 2/27/18, Topology Seminar, Northwestern University.

- 11/14/17, Algebra Seminar, Emory University.
- 11/8/17, Algebraic Geometry Seminar, University of Michigan.
- 10/11/17, Topology Seminar, University of Rochester.
- 9/22/17, Étale and Motivic Homotopy, Heidelberg, Germany.
- 7/25/17, Mathematical Congress of the Americas: special session on algebraic cycles, Montreal, CA.
- 4/28/17, Algebraic Geometry Seminar, Columbia University.
- 3/30/17, MSRI Hot-Topics Periods, Berkeley CA.
- 3/13/17, Algebro-geometric and Homotopical Methods, Institute Mittag-Leffler, Sweden.
- 2/15/17, Homotopy and Arithmetic 3, Imperial college, London.
- 9/10/16, Anabelian Geometry, Burlington, VT.
- 7/21/16, MFO Topologie, Oberwolfach, Germany.
- 7/23/16, Motivic Homotopy Groups of Spheres, Essen Germany.
- 6/15/16, Equivariant Derived Algebraic Geometry, American Institute of Mathematics.
- 11/13/15, 24th NRW Topology Meeting, Bochum, Germany.
- 8/20/15, K-theory, Cyclic Homology, and Motives: a conference in celebration of Weibel's 65th Birthday, Rutgers.
- 7/20/15, AMS Summer Institute in Algebraic Geometry, University of Utah.
- 5/13/15, K-theory Future Directions, Columbus.
- 5/6/15, Arithmetic and Algebraic Differentiation in honor of Alexandru Buium, Berkeley.
- 4/27/15, University of Minnesota Topology Seminar, Minneapolis.
- 4/25/15, Mid-Atlantic Topology Seminar in Honor of Nick Kuhn's 60th Birthday, Charlottesville.
- 1/13/15, JMM Special Session Recent Developments in Algebraic Number Theory, San Antonio.
- 11/8/14, JHU-UMD Algebra and Number Theory Day, College Park.
- 9/3/14, Vector Bundles and Algebraic Topology, Berlin.
- 7/11/14, Algebra Seminar Frankfurt.
- 7/1/14, Regensburg SFB.
- 6/4/14, Motivic Homotopy Groups of Spheres, Essen.
- 4/11/14, University of Western Ontario Algebra Seminar.
- 4/7/14, MSRI Evan's lecture.
- 3/27/14, Etale and Motivic Homotopy Theory, Heidelberg.
- 3/19/14, Fukuoka Soft Research Park, Low dimensional topology and number theory vi.
- 3/26/14, University of British Columbia topology seminar.
- 2/4/14, University of Chicago topology seminar.
- 2/3/14, Northwestern University topology seminar.

- Mini-course 1/23/14-1/24/14, MSRI Algebraic topology: Connections for Women.
- 11/9/13, University of South Carolina, Southeast commutative algebra and algebraic geometry.
- 11/5/13, Joint Athens-Atlanta Number theory seminar.
- 10/25/13, University of Virginia algebra seminar.
- 5/29/13, University of Southern California, Homotopical Methods in Algebraic Geometry.
- 5/11/13, University of Kentucky, Midwest Topology Seminar.
- 1/29/13, Wayne State University, Topology Seminar.
- 1/14/13, University of Western Ontario, Geometry and Topology Seminar.
- 11/26/12, MIT, Topology Seminar.
- 10/2/12, MIT, Number Theory Seminar.
- 7/23/12, Stanford University, Stanford Symposium on Algebraic Topology.
- 6/25/12, Institut de Mathématiques de Bordeaux, conference on Galois Covers and Deformations.
- 6/1/12, Imperial College London, Workshop on Arithmetic Geometry and Homotopy Theory.
- 3/10/12, Southern California Algebraic Geometry Seminar.
- 3/9/12, University of Southern California, Algebra Seminar.
- 3/5/12, Johns Hopkins, Topology Seminar.
- 2/15/12, Université de Montréal, Job-candidate talk.
- 2/8/12, University of Michigan, Algebraic Geometry Seminar.
- 1/27/12, University of Pennsylvania, Special lecture.
- 1/19/12, Colorado State University, Job-candidate talk.
- 12/8/11, Georgia Institute of Technology, Job-candidate talk.
- 11/7/11, MIT, Topology Seminar.
- 10/25/11, Berkeley, Number Theory Seminar.
- 9/23/11, Brown University, Algebraic Geometry Seminar.
- 3/17/11, Georgia Institute of Technology, Algebra Seminar.
- 2/11/11, Wesleyan University, Algebra Seminar.
- 12/2/10, McGill University, Québec-Vermont Number Theory Seminar.
- 11/8/10, MIT, Topology Seminar.
- 10/27/10, Mathematical Society of Japan Seasonal Institute at RIMS Kyoto, Development of Galois-Teichmüller theory and anabelian geometry.
- 4/29/10, Pennsylvania State University, Number Theory Seminar.
- 4/19/10, Harvard University, Faculty Colloquium.
- 3/23/10, Rice University, Algebraic Geometry Seminar.
- 2/9/2010, Universität Heidelberg MATCH, The arithmetic of fundamental groups PIA 2010.
- 11/10/09, Harvard, Harvard-MIT Algebraic Geometry Seminar.

- 11/6/09, University of Madison-Wisconsin, Midwest Number Theory Day.
- 10/26/09, MIT, Topology Seminar.
- 7/28/09, Newton Institute, Non-Abelian Fundamental Groups in Arithmetic Geometry: Introductory Workshop.
- 4/7/09, University Illinois Urbana-Champaign, Topology Seminar.
- 9/25/09, Brandeis, Everytopic Seminar.
- 11/4/08, University of Chicago, Topology Seminar.
- 11/3/07, University of Wisconsin, Graduate Student Conference in Number Theory.
- 10/26/2007, Stanford University, Algebraic Geometry Seminar.

Conferences, events, and workshops organized

- **Motivic Homotopy and Applications** July 12-16, 2021 (virtual), Park City Math Institute Graduate School Summer School, co-organized with Ben Antieau, Marc Levine, Oliver Röndigs, and Alexander Vishik.
- **Motivic Geometry** September 7-11, 2020 (virtual), Oslo, Norway, co-organized with Adrien Dubouloz, Marc Levine, Oliver Röndigs, and Paul Arne Østvær,
- **A room of one's own**, a writing event for mathematicians with intensive daily human care responsibilities, co-organized with Dorothy Buck and Lillian Pierce.
- **Connections for Women: Derived Algebraic Geometry, Birational Geometry, and Moduli Spaces** January 28-30, 2019 at MSRI, Berkeley, California, co-organized with Julie Bergner, Antonella Grassi, and Bianca Viray.
- **Special Session on Homotopy Theory** April 14-15, 2018 at Vanderbilt University, co-organized with Anna Marie Bohmann.
- **Nilpotent Fundamental Groups** Banff International Research Station, June 18-23, 2017, co-organized with Ján Mináč, Florian Pop, and Adam Topaz.
- **TAAAG: Topological Approaches to Algebra and Arithmetic Geometry** September 2-4, 2016, co-organized with Ben Antieau, and Danny Krashen.
- **2016 West Coast Algebraic Topology Summer School** on interactions between algebraic topology and number theory in chromatic homotopy theory. August 8-13, 2016. co-organizer.
- **Introduction to unstable motivic homotopy theory** Workshop June 10-12, 2016, co-organized with Ben Antieau, Marc Levine, and Ben Williams.
- **AMS special session on rational points on varieties.** January 5-6, 2012. Co-organizer with Jennifer Balakrishnan, Bjorn Poonen, and Bianca Viray.

Topics courses

- L-theory, bilinear forms and surgery, mini course Duke University Math 790-90, Fall 2021.
- Introduction to intersection theory, mini course, Duke University Math 790-90, Spring 2020.

- Characteristic classes, Duke University Math 690-10.01, Fall 2019.
- Stable Homotopy Theory, Georgia Institute of Technology Math 8803, Spring 2015.
- Advanced Algebraic Topology: Sullivan's Conjecture, Harvard University Math 231br, Spring 2013.

Service to the profession

- K-theory Foundation member, 2021-present.
- Member on the Oswald Veblen Prize in Geometry Committee, February 1, 2021 - January 31, 2024.
- MSRI Human Resources Advisory Committee, 2021-2024.
- served on three NSF panels.
- Georgia Tech College of Sciences Diversity Council, 2016-2019.

Older

- **Honors expository undergraduate thesis.** Harvard University. Spring 2003.
Billiards in Polygons. Advisor: Curtis McMullen.
- **Summer Research Experience for Undergraduates:** Williams College. Summer 2002.
Ergodic theory group. Advisor: Cesar Silva.
- **Summer Research Experience for Undergraduates:** Cornell University. Summer 2001.
Linear Transformations Preserving the Voronoi Polyhedron. Advisor: Konstantin Rybnikov.
- **Global Science Scholar Summer Internship.** Lucent Technologies. Summer 2000.
Minimal cost networks. Advisor: Iraj Saniee.