CURRICULUM VITAE
Jennifer Brooks

Education:

- Doctor of Philosophy in Mathematics,
  University of Wisconsin at Madison, May 2005.

  Thesis title: *Contributions to the Theory of the Holomorphic Extension of CR Functions*

  Advisor: Alexander Nagel.

- Bachelor of Arts, summa cum laude
  Ripon College, May, 1996.

Positions Held:

- Associate Professor of Mathematics, Brigham Young University, July 2019 – present.
- Associate Professor of Mathematics, University of Montana, Autumn 2010 – July 2019. (On leave 2015-2016 AY and 2016-2017 AY)
- Member of mathematics faculty, Bishop Kelly High School, Boise, ID, Autumn 2015 – May 2017.
- Associate Chair, Graduate Program, University of Montana, 2011 – 2012 and 2014 – 2015.
- Assistant Professor of Mathematics, University of Montana, August 2005 – 2010.
- TA Coordinator, mentoring new teaching assistants, University of Wisconsin, Fall 2004.
- Teaching Assistant, University of Wisconsin, Fall 1996 - Fall 1998; Spring 2002 – Fall 2003; Fall 2004 – Spring 2005.
- Adjunct Instructor in Mathematics, Ripon College, Spring 2001, Fall 2001.
- Math 112 (College Algebra) coordinator, Fall 1997, Spring 1998.

Research Interests:

- several complex variables, especially CR geometry
- harmonic analysis, especially singular integral operators

Publications: Note: Publications prior to 2014 appear under the name J. Halfpap.

- J. Brooks, S. Curry, D. Grundmeier, P. Gupta, V. Kuntz, A. Malcom, and K. Palencia, *Constructing group-invariant CR mappings*, Complex Anal. Synerg. 8, 20 (2022). https://doi.org/10.1007/s40627-022-00104-4

- J. Brooks, M. Dorff, A. Hudson, E. Pitts, C. Whiffen, and A. Woodall, *Zeros of a family of complex-valued harmonic trinomials*, Bulletin of the Malaysian Mathematical Sciences Society, 45(3), (2022) 1079–1091 .

- J. Brooks, D. Grundmeier, and H. Schenck, *Algebraic properties of Hermitian sums of squares, II*, Proc. Amer. Math. Soc., 150 (2022) 3471–3476.

- J. Brooks and D. Grundmeier, *Sum of squares conjecture: the monomial case in* $\mathbb{C}^2$, Math. Z., 299(1-2) (2021), 919–940.

- J. Brooks and K. Palencia, *A rank question for homogeneous polynomials*, Proc. Amer. Math. Soc., 149 (2021), 3627-3637.

- M. Brilleslyper, J. Brooks, M. Dorff, R. Howell, and L. Schaubroeck, *Zeros of a one-parameter family of harmonic trinomials*, Proc. Amer. Math. Soc., Series B, 7 (2020), 82–90.

- J. Brooks and D. Grundmeier, *Algebraic properties of Hermitian sums of squares*, Complex Var. Elliptic Equ., 65 (2020) no. 4, 695–712.

- J. Brooks, *An Interesting Family of Symmetric Polynomials,* American Mathematical Monthly, 126 (2019) no. 6, 527–540.

- J. Brooks, *Exploring the Infinite: Introduction to Proofs and Analysis,* CRC Press, 2017.

- D. Grundmeier and J. Halfpap Kacmarcik, *An application of Macaulay's estimates to sums of squares problems in several complex variables,* Proc. Amer. Math. Soc., 143, (2015), no. 4, 1411-1422.

- M. Gilliam and J. Halfpap, *The Szegö kernels for non-pseudoconvex tube domains in* $\mathbb{C}^2$*,* Complex Var. Elliptic Equ., 59 (2014) no. 6, 769-786 . See also arXiv:1107.1694v1[math.CV].

- J. Halfpap and J. Lebl, *Signature pairs for positive polynomials,* Bull. Inst. Math. Acad. Sin. (N.S.) 8 (2013), no. 2, 169-192 . See also arXiv:1211.0997v2 [math.AG],[math.CV].

- M. Gilliam and J. Halfpap, *The Szegö Kernel for Certain Non-Pseudoconvex Domains in* $\mathbb{C}^2$*,* Illinois J. Math., 55 (2011), no. 3, 871894 (2013).. See also arXiv:1107.1687v1 [math.CV].

- J. Halfpap, A. Nagel, and S. Wainger, *The Bergman and Szegö Kernels near Points of Infinite Type*, Pacific Journal of Mathematics, 246(1), (2010), 75-128.

- J. Halfpap, *Rotation of Wedges of Extendability for Tube-Like CR Manifolds of CR Dimension 1*, Michigan Math. J. 53 (2005), 319-328.

- J. Halfpap, *CR Extension for Tube-Like CR Manifolds of CR Dimension 1*, Illinois J. Math. 49(1) (2005), 295-323.

Submitted for Publication:

- J. Brooks, M. Dorff, S. Muthuprakash, and P. Tanner, *Zeros of several one-parameter families of harmonic functions,* (2023).

Grants:

- NSF Grant DUE-1356717, 7/1/14 – 6/30/19, "Increasing Diversity in Mathematics." Award amount: $610,296.

- NSF Grant DMS-1200815, 7/1/12 – 6/30/15, "CR Manifolds and Singular Integral Operators." Award amount: $96,565.

- NSF Grant DMS-0654195, 8/1/07 – 7/31/2010, "Singular Integral Operators in Several Complex Variables." Award amount: $74,200.

- PACE Visiting Scholar/Mentor Grant Awarded for Spring, 2007 to fund two 1-week collaborative visits with Dr. Malabika Pramanik at the University of British Columbia. Total award: $3,020.

- University Grant Program award of $1,000 made beginning May 2007 to support "Szegö Kernels for Model CR Submanifolds in $\mathbb{C}^n$," a joint project with Dr. Malabika Pramanik.

Presentations:

- *Convolutions, Singular Integrals, and Connections with Several Complex Variables,* Physics Theory Seminar, Brigham Young University, November 2022.

- *Commutative Algebra Meets Several Complex Variables*, Topics in Topology, Algebra, Etc. Research Seminar, Boise State University, October 15, 2021.

- *Algebraic Methods for the Study of Hermitian Sums of Squares*, East-West Several Complex Variables Seminar, June 15, 2021.

- *Hermitian Sums of Squares (3 talks)*, Analysis Seminar, University of Montana, February 2019.

- *Complex Numbers and Trigonometry,* Undergraduate Seminar, University of Montana, Februaty 2019.

- *Poisson Kernels, Singular Integral Operators, and Several Complex Variables,* Brigham Young University, November 2018.
- *Applications of Commutative Algebra to Sums of Squares Problems,* (4 talks), University of Montana Analysis Seminar, Fall 2017.
- *Geometry of Complex Numbers and Roots of Polynomials,* Boise Math Circle, Boise State University, December, 2015.
- *Sums of Squares Problems in Several Complex Variables,* Colloquium, Boise State University, September, 2014.
- *What is a Singular Integral Operator?* Colloquium, Boise State University, October, 2014.
- *The Szegö Kernel for Non-Pseudoconvex Tube Domains in* $\mathbb{C}^2$*,* Spring Lecture Series, University of Arkansas, April 2014.
- *A New Proof of the Sharp Degree Estimates for Proper Monomial Maps from* $\mathbb{B}_2$ *to* $\mathbb{B}_N$*,* invited talk in the special session "Several Complex Variables and CR Geometry" in the AMS Eastern Section meeting, October, 2013.
- *Understanding Projection Operators in Several Complex Variables through Harmonic Analysis.* Invited talk in the Special Session on Several Complex Variables Techniques in Operator Theory at the Joint AMS-MAA meeting in San Diego, CA, January 11, 2013.
- *Signature Pairs for Positive Polynomials on* $\mathbb{C}^n$*,* University of Arkansas Colloquium, November, 2012.
- *The Szegö Kernel for Non-Pseudoconvex Tube Domains in* $\mathbb{C}^2$*,* University of Arkansas Analysis Seminar, November, 2012.
- *The Harmonic Analysis Approach to the Szegö Projection,* Several Complex Variables Seminar, University of Michigan, September 2012.
- *The Szegö kernel for non-pseudoconvex tube domains in* $\mathbb{C}^2$*,* Several Complex Variables Seminar, University of Michigan, October 2011.
- *Sub-elliptic Multipliers and Kohn's Algorithm,* (6 talks), Analysis Seminar, University of Montana, Fall 2011.
- *Positivity Conditions for Polynomials,* (6 talks), Analysis Seminar, University of Montana, Spring 2011.
- *Proper Holomorphic Maps Between Balls,* (3 talks), Analysis Seminar, University of Montana, Fall 2010.

- *The Szegö Kernel for Certain Non-Pseudoconvex Domains,* (3 talks), Analysis Seminar, University of Montana, Fall 2009.
- *Fun with Complex Variables: Julia Sets,* Undergraduate Math Seminar, Fall 2009.
- *The Szegö Kernel for a Model CR Manifold,* (3 talks) Analysis Seminar, University of Montana, Spring 2009.
- *Szegö and Bergman Kernels for Tubular Domains near Points of Infinite Type,* Analysis Seminar, University of British Columbia, February 2009.
- *Asymptotic Expansion of Integrals.* (2 talks) Analysis Seminar, University of Montana, Spring 2008.
- *A Short Course on CR Manifolds.* (3 talks) Analysis Seminar, University of Montana, Spring 2008.
- *Estimating* $\int_{-\infty}^{\infty} e^{-p(x)}\,dx$*: Connections with the Szegö Kernel,* Analysis Seminar, University of Montana, April 2007.
- *The Szegö Kernel for Tubular Domains near a Point of Infinite Type.* Invited talk in the Special Session on Complex Dynamics and Complex Function Theory, AMS Section Meeting, March 2007, Miami University, Oxford, OH.
- *An Overview of Two Problems in Several Complex Variables.* Contributed talk, Special Session for Junior Faculty; MAA PNW Section Meeting, Southern Oregon University, June 2006.
- *CR Extension for Tube-like CR Manifolds of CR Dimension 1.* Contributed talk, International Conference on PDE, Complex Analysis, and Differential Geometry, Notre Dame, IN, June 2006.
- *The Szegö Projection Operator on Tubular Domains at a Point of Infinite Type.* (4 talks) Analysis Seminar, University of Montana, October 2006.
- *Insights Gained through Integration by Parts.* Undergraduate Seminar, University of Montana, October 2006.
- *Angular Derivatives in One and Several Complex Variables.* (3 talks) Analysis Seminar, University of Montana, March-April, 2006.
- *CR Extension for Tube-Like CR Manifolds of CR Dimension 1.* Invited talk, Special Session in Several Complex Variables; AMS Sectional Meeting, Notre Dame, IN, April 2006.
- *The Holomorphic Extension of CR Functions on Tube-Like CR Manifolds of CR Dimension 1: An Alternative to Wedge Extendability.* Contributed talk, Special Session on Extension of Functions; AMS-MAA Joint Meeting, San Antonio TX, January 2006.

- *Introduction to the Theory of CR Extension.* (3 talks) Analysis Seminar, University of Montana, October 2005.
- *How Big is the Cantor Set? Exploring Cardinality, Measure, and Dimension.* University of Montana Undergraduate Mathematics Seminar, September 2005.
- *The Problem of CR Extension.* University of Montana Mathematics Colloquium, February 2005.
- *An Alternative to Wedges in the Theory of CR Extension* AARMS-CRM Workshop on Singular Integrals and Analysis on CR Manifolds, Dalhousie University, Halifax, Nova Scotia, May 2004.
- *Moment Sequences, Convex Hulls of Curves in $\mathbb{R}^n$, and Their Application to a Problem of CR Extension.* Graduate Analysis Seminar, University of Wisconsin, March 2003.
- *The Snake Theorem of Karlin and a Representation Formula for a Non-negative Polynomial on a Finite Interval*, Analysis Seminar, University of Wisconsin, December 2002.
- *Convex Hulls of Sets in $\mathbb{R}^n$*, Ripon College Mathematics Colloquium, March 2002.

Classes taught:

- Fundamentals of Mathematics, Brigham Young University, Fall 2021.
- Calculus 2, Brigham Young University, Winter 2021.
- Measure and Integration Theory (G), Brigham Young University, Fall 2020.
- Calculus of Several Variables, Brigham Young University, Winter 2020, Winter 2021.
- Introduction to Complex Analysis, Brigham Young University, Fall 2019, Winter 2020, Fall 2020, Fall 2021.
- Honors Calculus 1 and 2, University of Montana, Fall 2017 – Spring 2018
- Special Topics: Hermitian Analysis (G), University of Montana, Spring 2014. Spring 2019.
- Special Topics: Several Complex Variables (G), University of Montana, Spring 2012.
- Functional Analysis (G), University of Montana, Spring 2011.
- Introduction to Abstract Mathematics, University of Montana, Spring 2011, Fall 2014, Spring 2019.
- Advanced Calculus I, University of Montana, Fall 2010, Fall 2011, Fall 2013.

- Multi-variable Calculus, University of Montana, Fall 2010.
- Special Topics: CR Manifolds (G), University of Montana, Fall 2008
- Real Analysis (G), University of Montana, Fall 2008.
- Complex Variables, University of Montana, Spring 2008, Spring 2010, Spring 2018.
- Topology (G), University of Montana, Fall 2007.
- Topics in Analysis: Fourier Analysis (G), University of Montana, Spring 2007.
- Intro. to Linear Algebra, Boise State University, Summer 2015.
- Advanced Calculus, University of Montana, Fall 2006.
- Calculus II, University of Montana, Spring 2006, Fall 2006, Spring 2007, Fall 2008, Spring 2010.
- Introduction to Real Analysis, University of Montana, Fall 2005, Fall 2017.
- Calculus I, University of Montana, Fall 2005, Fall 2007, Fall 2009.
- Calculus with Analytic Geometry II, Instructor, University of Wisconsin, Spring 2003.
- Elementary Statistics, Instructor, Ripon College.
- Trigonometry, Instructor, University of Wisconsin.
- College Algebra, Instructor, University of Wisconsin.
- Calculus with Analytic Geometry I and II, Teaching Assistant, University of Wisconsin
- Topics in Multi-Variable Calculus and Linear Algebra, Teaching Assistant, University of Wisconsin.
- Geometry and Algebra 2 (Bishop Kelly High School)

Advising:

- Currently directing the Ph.D. thesis of Alexander Lee (Ph.D. expected December 2026).
- Currently directing the Master's thesis of Rebekah Ottinger (M.S. expected April 2024).
- Directed the Master's thesis of Alexander Lee (M.S. expected December 2022).
- Directed the Master's thesis of David Work (M.S., December 2021).
- Directed the Mater's thesis of Samantha Sandberg (M.S., June 2021).

- Directed the Ph.D. thesis of Kevin Palencia-Infante (Ph.D., May 2020).
- Directed the Ph.D. thesis of Michael Gilliam (Ph.D., 2011).
- Directed the M.A. professional papers of Matthew Creek (M.A., 2009), Kevin Renna (M.A., 2009), and Michael Gilliam (M.A., 2008).
- Directed the Ph.D. research of Kevin Renna (ABD) and Doug Holstein.

Service:

- Co-organizer of the Special Session "Several Complex Variables: Emerging Applications and Synergies," AMS Fall Western Section Meeting, October 2020.
- Chair of Teaching Support Committee, Brigham Young University, July 2020 – present.
- Faculty advisor to the Women in Mathematics organization, Brigham Young University, Fall 2019 – present.
- Graduate Committee, Brigham Young University, Fall 2019 – present.
- Director of the NSF-funded $(MT)^2$ program 7/14 – 7/15.
- NSF DMS FY 2013, 2014, and 2015 panels.
- Associate Chair - Graduate Program, Department of Mathematical Sciences, 8/2011 - 7/2012 and 8/2014 - 7/2015.
- Co-organizer of the Special Session "Interplay between Geometry and Partial Differential Equations in Several Complex Variables ," AMS Central Section Meeting in Lawrence, KS, March 31-April 1, 2012.
- University of Montana Graduate Council, 9/2011 - 4/2012 and Spring 2015.
- University of Montana Faculty Senate, term 5/2008 - 5/2011.
- Graduate Committee, Department of Mathematical Sciences, University of Montana, Fall 2006 – Spring 2008, Fall 2009 – Spring 2012, Fall 2017 – present.
- Chair of calculus textbook committee, 2010, 2011.
- Calculus coordinator, Fall 2008 - Spring 2011.
- Instructor of the Montana Science and Mathematics Consortium, a professional development program for in-service public school teachers.
- Undergraduate Committee, Department of Mathematical Sciences, University of Montana, August 2005 - present.

- MAA liaison, March 2006 - present.
- Referee for *Illinois J. Math.,* 2012, *Transactions*, 2005, MAA Monthly 2019, 2020, Canadian Journal of Mathematics, 2019.. Reviewer for Springer-Birkhäuser, 2012.

Other Professional Activities:

- Faculty mentor for (MT^2) and F-GAP programs supporting women and under-represented minorities.
- Invited to attend the AIM (American Institute of Mathematics) Workshop: Emerging Applications of Complexity for CR Mappings, September 13-17, 2010.
- Served as a mentor to undergraduates at the 2010 Hope College REU.
- Invited and partially supported to attend the workshop "Complex Analysis and Complex Geometry," Banff International Research Station, May 2009.
- Invited and partially supported to attend the conference "CR Geometry and PDE's II" in Levico, Italy, June 22-27 2008.
- Invited to give a talk at the March 2008 AMS Central Section Meeting in a Special Session on Harmonic Analysis and Partial Differential Equations in Real and Complex Domains. (unable to attend)
- Co-organized a panel discussion "Getting Undergraduates Involved in (my) Research at MAA Mathfest August 2007 in San Jose.
- Invited to and attended an AIM (American Institute of Mathematics) workshop "Polya-Schur-Lax Problems: Hyperbolicity and Stability Preservers."
- Organized a special session for research talks by junior faculty at the Spring 2007 MAA PNW Section meeting at Linfield College.
- 2006 National Project NExT Fellow.
- 2006 PNW Project NExT Section Fellow.
- Participant in the Peer Review of Teaching Project, University of Montana, Autumn 2005, Spring 2006.

Awards and Honors:

- 2021 Distinguished Teaching Award, Department of Mathematics, Brigham Young University.
- 2009 Cox Educational Excellence Award, University of Montana.

- 2004 Excellence in Teaching Award, Department of Mathematics, University of Wisconsin-Madison.
- 2002 Elizabeth Hirschfelder Award for Graduate Women in Mathematics.
- Phi Beta Kappa, 1996.