[heatherw3521.github.io](http://heatherw3521.github.io)

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Heather D. Wilber

**EDUCATION**

Cornell University, Ithaca, NY PhD, Applied Mathematics May 2021

Advisor: Prof. Alex Townsend

**DISSERTATION:** [*Computing numerically with rational functions.*](https://heatherw3521.github.io/phd_thesis.pdf)

*(Awarded* [*AWM Dissertation Prize*](https://awm-math.org/awards/awm-dissertation-prize/) *2022,* [*Householder Prize*](https://users.ba.cnr.it/iac/irmanm21/HHXXI/hhprize.html) *2022)*

Boise State Univ., Boise, ID M.S., Mathematics Aug 2016

Advisor: Prof. Grady Wright

**THESIS:** [*Numerical computing with functions on the sphere and disk*](https://people.cam.cornell.edu/hdw27/msc_thesis.pdf)*.*

*(Selected as* [*Distinguished Thesis*](https://www.boisestate.edu/graduatecollege/distinguished-scholarship-awards/) *in STEM for 2016-2017)*

Boise State Univ., Boise, ID B.S., Mathematics Dec 2007

Boise State Univ., Boise, ID B.A., English-Linguistics Dec 2007

**PREVIOUS POSITION**

Oden Institute, University of Texas at Austin:NSF postdoctoral fellow, July 2021-July 2023

**CURRENT POSITION**

Dept. of Applied Mathematics, University of Washington:Assistant Professor, July 2023-present

**MANUSCRIPTS IN PROGRESS**

1. Epperly, E.N., Barnett, A., Wilber, H. *A superfast direct inversion method for the nonuniform discrete Fourier transform*

8. Chen, K., Martinsson, G., Wilber, H. *A fast, high-accuracy method for solving the fractional Poisson equation in complex geometries.*

1. Beckermann, B., Kressner, D., Wilber, H. *Compression properties in rank-structured solvers for Toeplitz-like linear systems*

**JOURNAL PUBLICATIONS**

6*.* Wilber, H., Damle, A., Townsend, A. [*Data-driven algorithms for signal processing with trigonometric rational functions.*](https://arxiv.org/abs/2105.07324) *SIAM J. Sci. Comput., 44-3, C185-C209 (2022).*

5*.* Rubin, D., Townsend, A., Wilber, H. [*Bounding Zolotarev numbers using Faber rational functions.*](https://arxiv.org/abs/1911.11882)

*Constructive Approx., 56, 1-26. (2022)*

4. Quinn, K., Wilber, H., Townsend, A., Sethna, J.P. [*Chebyshev approximation and the global geometry of model predictions*](https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.122.158302)*. Phy. Rev. Let., 122(15), 158302 (2019).*

3*.* Townsend, A., Wilber, H. [*On the singular values of matrices with high displacement rank*](https://www.sciencedirect.com/science/article/abs/pii/S0024379518301009)*.*

*Linear Alg. Appl., V. 548, 19-41 (2018).*

2*.* Wilber, H., Townsend, A., Wright, G. [*Computing with functions in spherical ands polar geometries II. The disk*](https://epubs.siam.org/doi/abs/10.1137/16M1070207?journalCode=sjoce3)*. SIAM J. Sci. Comput., 39-3, C238-C262 (2017).*

1*.* Townsend, A., Wilber, H., Wright, G. [*Computing with functions in spherical and polar geometries I. The sphere*](https://epubs.siam.org/doi/abs/10.1137/15M1045855?journalCode=sjoce3)*. SIAM J. Sci. Comput., 38-4, C403-C425 (2016).*

**INVITED TALKS**

15. DOMAIN DECOMPOSITION 28 (KAUST, Saudi Arabia)

*Plenary talk: Superfast inversion methods for highly structured matrices (Feb. 2024)*

14. APPLIED MATH SEMINAR (University of Washington, Seattle, WA)

*Talk: Adventures in structured matrix approximation methods (Nov. 2023)*

13. 4TH BIENNIAL MEETING OF SIAM PACIFIC NORTHWEST (Western Washington Univ., Bellingham, WA)

*Plenary Talk: Three big ideas in rational approximation (Oct. 2023)*

12. NUMERICAL ANALYSIS IN THE 21st CENTURY (University of Oxford, Oxford, UK)

*Plenary Talk: What can the square root approximation teach us? (Aug. 2023)*

11. FLUID MECHANICS AND WAVES SEMINAR (New Jersey Institute of Technology, Newark, NJ)

*Talk: Hierarchical solvers for special linear systems (April 2023)*

10. MATHEMATICS COLLOQUIUM (Temple University, Philadelphia, PA)

*Talk: Designing low rank methods via rational functions (Dec. 2022)*

9. APPLIED MATHEMATICS COLLOQUIUM (Univ. Colorado at Boulder, Boulder, CO)

*Talk: Rational functions in computational mathematics (Nov. 2022)*

8. MATHEMATICS COLLOQUIUM (Baylor University, Waco, TX)

*Talk: Zolotarev rational functions in computational mathematics (Oct. 2022)*

1. BABUŠKA FORUM SERIES (Univ. Texas at Austin, Austin, TX)

*Talk: Computing with rational approximations to the square root (Oct. 2022)*

1. HOUSEHOLDER XXI: HOUSEHOLDER PRIZE PLENARY LECTURE (Bari, Italy)

*Plenary Talk: The low rank properties of structured matrices: a rational explanation* *(June 2022)*

5. [CAVID:COMPLEX ANALYSIS VIDEO SEMINAR SERIES](https://master.researchseminars.org/seminar/CAvid)(virtual)

*Talk: Low rank numerical methods via rational function approximation (June 2022)*

4. UNIV. DELAWARE NUMERICAL ANALYSIS AND PDE SEMINAR (virtual)

*Talk: Low rank methods for structured matrices. (May 2022)*

3. UNIV. TEXAS LIBRARIES NATIONAL POETRY MONTH EVENT (virtual)

*Talk:* [The poetry of math and the math of poems](https://www.lib.utexas.edu/events/494) *(April 2022)*

1. BOISE STATE UNIV. MATHEMATICS COLLOQUIUM (Boise State Univ., Boise, ID)

*Talk: Low rank methods for structured matrices. (Feb. 2022)*

1. CCM SEMINAR SERIES, FLATIRON INSTITUTE (virtual)

*Talk: Designing low rank methods for matrices with displacement structure. (May 2021)*

**SELECTED PRESENTATIONS**

19. 4TH BIENNIAL MEETING OF SIAM PACIFIC NORTHWEST (Western Washington Univ., Bellingham, WA)

*Talk: A fast direct method for the nonuniform discrete Fourier transform (Oct. 2023)*

18. COMPLEX ANALYSIS: TECHNIQUES, APPLICATIONS, AND COMPUTATIONS

(Cambridge University, Cambride UK)

*Talk: Zolotarev numbers and inverse nonuniform discrete Fourier transforms. (July 2023)*

17. SIAM ANNUAL MEETING 2022 (Pittsburgh, PA)

[*Poster: Data-driven computing with trigonometric rational functions*](https://heatherw3521.github.io/REFIT_POSTER_all.pdf) *(July 2022)*

16. [RISING STARS](https://www.sandia.gov/risingstars/) 2022 (Sandia Labs, Albuquerque, NM)

*Talk: Data-driven computing with trigonometric rational functions (April 2022)*

15. 2021 CONFERENCE ON FAST DIRECT SOLVERS (virtual)

*Talk: Designing low rank methods for matrices with displacement structure. (Oct. 2021)*

14. GAMM 2021 (virtual)

*Talk: Compression properties and rank-structured solvers for Toeplitz, Vandermonde and related linear systems (March 2021)*

13. SIAM ANNUAL MEETING (virtual)

*Talk: Computing with rational approximations with applications in signal processing (July 2020)*

12. 27th BIENNIAL NUMERICAL ANALYSIS CONFERENCE (Univ. of Strathclyde, Strathclyde, UK)

*Talk:**Compression properties in rank-structured solvers for Toeplitz linear systems (June 2019)*

***awarded SIAM UKIE prize: Best student presentation***

11. APPROXIMATION THEORY 16 (Vanderbilt University, Nashville, TN)

*Talk:**Rational approximation in superfast rank-structured solvers (May 2019)*

10. EPFL Numerical Analysis Group (EPFL, Lausanne, Switzerland)

*Talk:**Numerical computing in polar and spherical geometries**(Dec. 2018)*

9. EPFL Numerical Analysis Group (EPFL, Lausanne, Switzerland)

*Talk:**On the singular values of matrices with high displacement rank (Nov. 2018)*

8. ICOSAHOM (Imperial College London, UK)

*Talk:**A low rank and spectrally accurate elliptic PDE solver (July 2018)*

7. SIAM CONF. ON COMPUTATIONAL SCIENCE AND ENGINEERING (Atlanta, GA)

*Talk:**A factored ADI method for Sylvester equations with high-rank right-hand sides (Feb. 2017)*

6. SIAM CONF. ON COMPUTATIONAL SCIENCE AND ENGINEERING (Atlanta, GA)

*Poster:**Numerical computing with functions in spherical and polar geometries (Feb. 2017)*

5. WORKSHOP ON FAST DIRECT SOLVERS (Purdue Univ., Lafayette, IN)

*Talk:**Numerical computing with functions on the sphere and disk (Nov. 2016)*

4. SCIENTIFIC COMPUTING AND NUM. ANALY. SEMINAR (Cornell University, Ithaca, NY)

*Talk:**Numerical computing with functions on the sphere and disk (Sept. 2016)*

3. SIAM ANNUAL MEETING (Boston, MA)

*Talk: Numerical computing in polar and spherical geometries (July 2016)*

2. OXFORD NUM. ANALYS. GROUP SEMINAR (University of Oxford, Oxford, UK)

*Talk: Computing with functions on the sphere and disk (July 2016)*

1. PACIFIC NORTHWEST NUMERICAL ANALYSIS SEMINAR

[*Poster: Computing with functions on the sphere and disk*](https://heatherw3521.github.io/poster.pdf) *(Oct. 2015)*

**SOFTWARE DEVELOPMENT**

O [Structmats](https://github.com/heatherw3521/Structmats)

Open-source code for computing with structured matrices

o [REfit](https://github.com/heatherw3521/REfit)

Open-source code for computing with trigonometric rational functions and exponential sums

o [freeLyap](https://github.com/ajt60gaibb/freeLYAP) Iterative solvers package

Open-source code for solving Sylvester and Lyapunov matrix equations

o [CHEBFUN PROJECT](https://www.chebfun.org/)

*Spherefun* and *Diskfun* in the open-source project *Chebfun*

**SELECTED FELLOWSHIPS AND AWARDS**

o [Householder Prize](https://users.ba.cnr.it/iac/irmanm21/HHXXI/hhprize.html) (2022)

o [AWM Dissertation Prize](https://math.cornell.edu/heather-wilber-awarded-awm-dissertation-prize) (2022)

o National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship (2021)

o SIAM UKIE prize: Best student presentation, 27th Biennial Numerical Analysis conference (2019)

o National Science Foundation Graduate Research Fellowship (NSF GRF) (2016)

o [Distinguished Thesis Award](https://www.boisestate.edu/graduatecollege/distinguished-scholarship-awards/) (2017)

o [National Aeronautics and Space Administration (NASA) Fellowship Award](https://www.boisestate.edu/coas/blog/2015/09/22/math-student-receives-prestigious-nasa-fellowship/) (2015-2016)

**PROFESSIONAL ACTIVITIES**

* Referee: SIAM J. Scientific Computing, J. Comp. Physics, IMA J. of Num. Analysis, Arkiv der Mathematik,

BIT numerical methods, Amer. Math. Soc., Adv. in Comp. Math., Electr. Trans. on Num. Analysis

* Department of Applied Mathematics DEI committee member 2023-present
* AWM faculty advisor for UW applied math AWM student chapter 2023-present
* Lead Organizer: Banff International Research Institute 2025 proposal for workshop titled “Challenges, opportunities, and new horizons in rational approximation”
* Minisymposium organizer/co-chair: SIAM LA24, (Paris, France) May 2024
* Minisymposium organizer/co-chair: 4th BIENNIEL MTG SIAM PNW, (Bellingham, WA) July 2022

o Minisymposium organizer/co-chair: SIAM AN2022, (Pittsburgh, PA) July 2022

o Consultant: [X-prize Carbon removal](https://pop.xprize.org/prizes/xprize_carbon_capture/overview) competition with [Ecorestoration Alliance team](https://site48137.overdrive.io/) 2022

o Minisymposium organizer and co-chair: SIAM AN2020, (Virtual) July 2020

o AWM outreach mentor 2019

o Rural schools outreach volunteer with NASA STEM Mathematics Initiative 2015-2016

**TEACHING EXPERIENCE**

**University of Washington Seattle, WA Sept 2023-current**

*Instructor*

* Autumn 2023: Amath 584, Applied Linear Algebra and Introductory Numerical Analysis

**University of Texas at Austin Austin, TX August 2022-May 2023**

*Instructor*

* Spring 2023: Sequences, Series and Multivariable Calculus
* Fall 2022: Advanced Calculus with Applications, II

**Cornell University Ithaca, NY August 2020-Dec. 2020**

*Teaching assistant*

o Spring 2021: Teaching Assistant for Prof. Steven Strogatz, Mathematical Explorations

o Fall 2020: Teaching Assistant for Prof. Alex Townsend, Linear Algebra for Engineers

**Boise State University Boise, Idaho August 2014-May 2015**

*Instructor*

o Spring 2015: Analytic Trigonometry

o Spring 2015: Trigonometry project and assessment design team member

o Fall 2014: Analytic Trigonometry, College Algebra.

**Rimrock Jr. Sr. High School** **Bruneau, Idaho** **August 2013-May 2014**

*High School Math Teacher*

o pre-algebra, algebra II, geometry, trigonometry, pre-calculus and Title-I interventionist