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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.*
(Awarded AWM Dissertation Prize 2022, Householder Prize 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.*
(Selected as Distinguished Thesis 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

JOURNAL PUBLICATIONS AND PREPRINTS

11. Wilber, H., Vaes, W., Gopal, A. and Martinsson, P.G. *A time-frequency method for acoustic scattering with trapping*. Preprint *(2025).*
10. Ballew, C., Trogdon, T., and Wilber, H. *The Akhiezer iteration and inverse-free solvers for Sylvester matrix equations.* Preprint *(2025).*
9. Beckermann, B., Kressner, D., and Wilber, H. *Compression properties for large Toeplitz-like matrices.* Submitted to *Numerical Algorithms (2025).*
8. Trefethen, L.N., Wilber, H. *Computation of Zolotarev rational functions.* Submitted to SISC *(2024).*
7. Wilber, H., Epperly, E., Barnett, A. *A superfast direct inversion method for the nonuniform discrete Fourier transform. to appear in SISC (2025).*
6. Wilber, H., Damle, A., Townsend, A. *Data-driven algorithms for signal processing with trigonometric rational functions. SIAM J. Sci. Comput., 44-3, C185-C209 (2022).*
5. Rubin, D., Townsend, A., Wilber, H. *Bounding Zolotarev numbers using Faber rational functions. 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. Phy. Rev. Let., 122(15), 158302 (2019).*
3. Townsend, A., Wilber, H. *On the singular values of matrices with high displacement rank. 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. 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. SIAM J. Sci. Comput., 38-4, C403-C425 (2016).*

INVITED TALKS

22. HOUSEHOLDER XXII PLENARY LECTURE (Cornell University, Ithaca, NY)
Talk: Acoustic scattering in unfriendly domains (June 2025)
21. UNIVERSITY OF CALIFORNIA, DAVIS APPLIED MATH SEMINAR (UC Davis, Davis, CA)
Talk: Approximation theory and fast direct solvers (June 2025)
20. UNIVERSITY OF CHICAGO CAM SEMINAR (University of Chicago, Chicago, IL)
Talk: The acoustic wave equation (Feb. 2025)
19. PRINCETON APPL. AND COMPUTATIONAL MATHEMATICS SEMINAR (Princeton University, Princeton, NJ)
Talk: Zolotarev numbers and the nonuniform discrete Fourier transform (Nov. 2024)
18. MATRIX SEMINAR (University of Reno, Nevada)
Talk: Zolotarev rational approximation in computational mathematics (Sept. 2024)
17. SIAM CONF ON APPLIED LINEAR ALGEBRA (Paris, France)
Plenary talk: Superfast direct inversion methods for highly structured matrices (May 2024)
16. COLLOQUIUM SALIENTIA (Portland State University, Portland, OR)
Talk: Designing Specialized Low Rank Methods (March 2024)
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)
7. BABUŠKA FORUM SERIES (Univ. Texas at Austin, Austin, TX)
Talk: Computing with rational approximations to the square root (Oct. 2022)
6. 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 (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 (April 2022
2. 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

20. NSF COMPMATH MEETING (University of Utah, Salt Lake City, UT)
    Talk: A hybrid time-frequency method for acoustic scattering (May 2025)
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 (July 2022)
16. RISING STARS 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 (Oct. 2015)

SOFTWARE DEVELOPMENT

- Structmats

Open-source code for computing with structured matrices

- REfit

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

- freeLyap Iterative solvers package

Open-source code for solving Sylvester and Lyapunov matrix equations

- CHEBFUN PROJECT

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

SELECTED FELLOWSHIPS AND AWARDS

- Householder Prize (2022)
- AWM Dissertation Prize (2022)
- National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship (2021)
- SIAM UKIE prize: Best student presentation, 27th Biennial Numerical Analysis conference (2019)
- National Science Foundation Graduate Research Fellowship (NSF GRF) (2016)
- Distinguished Thesis Award (2017)
- National Aeronautics and Space Administration (NASA) Fellowship Award (2015-2016)

ADVISING

- Raaga Vangala,Advisor for undergraduate research project, *New methods in bivariate approximation via rational functions.* (Summer 2025--)
- Daniel Dou, Committee chair, M.S. thesis (Autumn 2023—Spring 2025)
  **** Daniel will be continuing mathematical research as a PhD student at Michigan State University***
- Wietse Vaes, Co-Advisor, Committee Co-chair, PhD dissertation (Spring 2024--)
- Levent Batakci, Advisor for Structmats coding project (Spring 2024—Summer 2024)
- Arjun Sethi-Olowin, Co-Advisor, Committee Co-chair, PhD dissertation (Spring 2024---)
- Emily Zhang, Advisor for Quantum Computing and Approx. Theory project (Autumn 2025--)
- Melanie Kirchies (TU Chemnitz), external examiner, PhD dissertation (Fall 2024)
- Kaitlynn Lilly, Committee member, PhD dissertation (Fall 2024--)
- Charbel Abi Younes, Committee member, PhD dissertation (Spring 2024--)
- Josephine Thacher-Noone, Advisor for undergraduate research project, *Halofun: spectral methods and low rank computations on annuli.* (Summer 2024—Spring 2025)
  **** Josephine was awarded an NSF graduate research fellowship for work related to this project and a Boeing undergraduate research award.***
- Kalliah Severman, Chris Lu, Wietse Vaes, Supervisor for WXML project: *Finite element methods for advection-diffusion.* (Fall 2024)
- HaoCheng Cai, GSR, PhD committee (Spring 2025)

PROFESSIONAL ACTIVITIES

SIAM PNW chapter treasurer	Aug 2024-present
Referee: App. Math. Letters, 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	Ongoing
Lead Organizer: Banff International Research Institute workshop "Challenges, opportunities, and new horizons in rational approximation"	April 2025
Minisymposium organizer/co-chair: SIAM LA24, (Paris, France)	May 2024
WAMM mentor faculty advisor	Feb 2024-present
Minisymposium organizer/co-chair: 4th BIENNIAL MTG SIAM PNW, (Bellingham, WA)	July 2022
Minisymposium organizer/co-chair: SIAM AN2022, (Pittsburgh, PA)	July 2022
Minisymposium organizer and co-chair: SIAM AN2020, (Virtual)	July 2020

TEACHING EXPERIENCE

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

Instructor

- Autumn 2025: Amath 590, Beyond the SVD: Low rank approximation methods for big problems
- Autumn 2025: Amath 584, Applied Linear Algebra and Introductory Numerical Analysis
- Autumn 2024: Amath 301, Introductory Scientific computing
- Spring 2024: Amath 352, Applied Linear Algebra and Introductory Numerical Analysis
- 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

- Spring 2021: Teaching Assistant for Prof. Steven Strogatz, Mathematical Explorations
- Fall 2020: Teaching Assistant for Prof. Alex Townsend, Linear Algebra for Engineers

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

Instructor

- Spring 2015: Analytic Trigonometry
- Spring 2015: Trigonometry project and assessment design team member
- Fall 2014: Analytic Trigonometry, College Algebra.

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

High School Math Teacher

- pre-algebra, algebra II, geometry, trigonometry, pre-calculus