

# Mary Vaughan

---

CONTACT INFORMATION	Department of Mathematics The University of Texas at Austin 9.118 PMA 2515 Speedway Austin, TX 78712 USA	Email: <a href="mailto:maryv@utexas.edu">maryv@utexas.edu</a> Website: <a href="https://maryvaughan.github.io">maryvaughan.github.io</a>
EDUCATION	<b>Iowa State University</b> , Ames, IA Ph.D. in Mathematics ◊ Dissertation Title: <i>Analysis of nonlocal equations: One-sided weighted fractional Sobolev spaces and Harnack inequality for fractional nondivergence form elliptic equations</i> ◊ Advisor: Pablo Raúl Stinga  <b>University of Wisconsin–La Crosse</b> , La Crosse, WI B.S. in Mathematics ◊ Minor in chemistry	2015-2020       2011-2015
CURRENT EMPLOYMENT	<b>RTG Postdoctoral Researcher</b> The University of Texas at Austin Department of Mathematics ◊ Supervisors: Luis Caffarelli and Stefania Patrizi	Aug 2020-present
PREVIOUS EMPLOYMENT	<b>Graduate Teaching Assistant</b> Iowa State University Department of Mathematics	Aug 2015-Aug 2020
RESEARCH INTERESTS	<b>Partial Differential Equations and Harmonic Analysis</b> Nonlocal equations, fractional derivatives, fractional Laplacians, regularity theory, materials modeling, viscoelasticity, peridynamics, frame theory, Kaczmarz algorithm	
PUBLICATIONS	[1] P. R. Stinga and M. Vaughan, Fractional derivatives, fractional Laplacians, and weighted Sobolev spaces, <i>Nonlinear Anal.</i> <b>193</b> (2020), 111505. [2] A. Aboud, E. Curl, S. N. Harding, M. Vaughan, and E. S. Weber, The dual Kaczmarz algorithm, <i>Acta Appl Math</i> <b>165</b> (2020), 133–148.	
PAPERS IN PREPARATION	[3] P. R. Stinga and M. Vaughan, Fractional elliptic equations in nondivergence form: definition, applications and Harnack inequality, (2021), 54 pp. submitted. [4] P. Seleson, P. R. Stinga, and M. Vaughan, Peridynamic models for viscoelastic materials.	
WORKSHOPS	<b>Structured Quartet Research Ensembles (SQuaREs)</b> AIM Institute, San Jose, CA Proposal title: Fractional Laplacians on Fractal Domains	2021-2024

FELLOWSHIPS AND INTERNSHIPS	<b>Robert J. Lambert Graduate Assistantship</b>	Spring 2020
	Iowa State University, Department of Mathematics Teaching release awarded to one graduate student to improve the quantity and quality of research	
	<b>Brown Graduate Fellowship, \$10,000</b>	Fall 2019-Spring 2020
	Iowa State University, Office of the Vice President for Research One of twelve students across the university to receive this award	
	<b>NSF-MSGI Summer Internship, \$12,000</b>	Summer 2018
	Project Title: Fractional PDEs for materials modeling Mentor: Pablo Seleson Hosting Facility: Oak Ridge National Laboratory One of twenty students to be selected	
	<b>Dean's Distinguished Summer Fellowship, \$4,000</b>	Summer 2014
	University of Wisconsin-La Crosse, College of Science and Health Mentor: James Peirce	
GRANTS	<b>Graduate Student Travel Grant, \$250</b>	October 2018
	American Mathematical Society Purpose: Invited to present at AMS Sectional Meeting in Ann Arbor, MI	
	<b>Inclusion Initiatives Grant (Co-PI), \$1,580</b>	May 2018
	Iowa State University, Office of the Vice President for Diversity and Inclusion Purpose: Host the Midwest Mathematics Inclusion and Diversity Workshop for Undergraduates, October 2018	
	<b>Women's and Diversity Grant Award (Co-PI), \$5,000</b>	May 2017
	Iowa State University, Office of the Vice President for Diversity and Inclusion Purpose: Host the first Joint EDGE-MOCA Speaker Series, 2018-19	
	<b>Student Travel Grant, \$400</b>	Fall 2015
	University of Wisconsin-La Crosse Purpose: Present at the Joint Mathematics Meetings in San Antonio, TX	
HONORS AND AWARDS	Honorable Mention in the Elevating Mathematics Video Competition National Academies' Board on Mathematical Science and Analytics Video found at <a href="https://youtu.be/tSy1HPE6WKk">https://youtu.be/tSy1HPE6WKk</a>	March 2019
	<b>Robert J. Lambert Research Award, \$1,000</b>	Fall 2018
	Iowa State University, Department of Mathematics Awarded to one graduate student for research excellence	
	<b>Graduate College Teaching Excellence Award, \$250</b>	Fall 2017
	Iowa State University, Graduate College Awarded to the top 10% of the graduate students involved in teaching	
	<b>Outstanding Work in Mathematics Award</b>	Spring 2014, 2015
	University of Wisconsin-La Crosse, Department of Mathematics	

Freshmen Chemist of the Year  
University of Wisconsin–La Crosse, Department of Chemistry

Spring 2012

RESEARCH  
STAYS

Oak Ridge National Laboratory, TN

January 2019

INVITED  
CONFERENCE  
TALKS

- [1] 16th U.S. National Congress on Computational Mechanics, Chicago (USA), July 2021 - upcoming
- [2] *A priori estimates for fractional powers of nondivergence form elliptic operators* at AIMS Conference on Dynamical Systems, Differential Equations and Applications, Atlanta, GA. June 2020 - canceled due to COVID19
- [3] *Fractional derivatives and characterizations of one-sided weighted Sobolev spaces* at Young Researchers Minisymposium, Onna, Okinawa, Japan. February 2020
- [4] *Fractional derivatives in one-sided weighted Sobolev spaces* at SIAM Central States Section, Ames, IA. October 2019
- [5] *Fractional derivatives in one-sided weighted Sobolev spaces* at AMS Sectional Meeting, Special Session on Recent Trends on Local, Nonlocal and Fractional Partial Differential Equations, Ann Arbor, MI. October 2018

INVITED SEMINARS  
AND COLLOQUIUM  
TALKS

- [1] Continuum Mechanics Seminar, University of Nebraska-Lincoln, NE. March 2021
- [2] *An Introduction to the Nonlocal Peierls-Nabarro in 1D* at SIAM Student Chapter, Iowa State University, IA. March 2021
- [3] *A priori estimates for fractional powers of nondivergence form elliptic operators* at PDE & Analysis Seminar, University of Pittsburgh, PA. February 2020
- [4] *What is a fractional derivative?* at Colloquia, Carleton College, MN. November 2019
- [5] *Viscoelasticity and Fractional Derivatives* at Continuum Mechanics Seminar, University of Nebraska–Lincoln, NE. April 2019
- [6] *How to define fractional Laplacians and fractional derivatives* at Continuum Mechanics Seminar, University of Nebraska–Lincoln, NE. April 2018
- [7] *A brief history and comparison of fractional derivatives* at UWL Math Club, University of Wisconsin–La Crosse, WI. November 2018
- [8] *Two talks: the truth about graduate school and what is a fractional derivative?* at UWL Math Club, University of Wisconsin–La Crosse, WI. November 2017

OTHER TALKS

Conference talks

- [1] *A priori estimates for fractional powers of nondivergence form elliptic operators* at Texas Differential Equations Conference, Austin, TX. March 2020
- [2] *One-sided fractional derivatives and weighted Sobolev spaces* at Joint Mathematics Meeting, Denver, CO. January 2020
- [3] *Fractional derivatives and one-sided weighted Sobolev spaces* at 7th Midwest Women in Mathematics Symposium, Iowa City, IA. April 2019
- [4] *Investigating the dependence of transmission rate to water temperature in a host-parasite system* at Wisconsin MAA Section Meeting, Ripon College, WI. April 2015

- [5] *Investigating the dependence of transmission rate to water temperature in a host-parasite system* at Joint Mathematics Meeting, San Antonio, TX. January 2015

#### Seminars

- [1] Fractional powers of nondivergence form elliptic operators Junior Analysis Seminar, Iowa State University, IA. January 2020
- [2] *Viscosity Solutions of Elliptic Equations (2 Days)* at Junior Analysis Seminar, Iowa State University, IA. October & November 2019
- [3] *Fractional derivatives in one-sided weighted Sobolev spaces* at SIAM Seminar, Iowa State University, IA. November 2018
- [4] *What are fractional derivatives?* at Graduate Student Seminar, Iowa State University, IA. September 2018.
- [5] *Fractional PDEs for materials modeling* at Computational and Applied Mathematics Seminar, Oak Ridge National Laboratory, TN. August 2018
- [6] *How to define fractional Laplacians and fractional derivatives* at Analysis Seminar, Iowa State University, IA. April 2018
- [7] *Investigating the dependence of transmission rate to water temperature in a host-parasite system* at Mathematics Department Colloquium, University of Wisconsin–La Crosse, WI. October 2014
- [8] *Investigating the dependence of transmission rate to water temperature in a host-parasite system* at Mathematics-Biology Working Group, University of Wisconsin–La Crosse, WI. October 2014
- [9] *Investigating the dependence of transmission rate to water temperature in a host-parasite system* at Dean’s Distinguished Fellowship Meeting, University of Wisconsin–La Crosse, WI. July 2014

#### POSTER PRESENTATIONS

- [1] *Viscoelasticity and fractional derivatives* at Workshop on Experimental and Computational Fracture Mechanics, Baton Rouge, LA. February 2020
- [2] *Fractional derivatives and Laplacians in one and two-sided weighted Sobolev spaces* at the 2020 Joint Mathematics Meeting, Denver, CO. January 2020
- [3] *Fractional derivatives and Laplacians in one and two-sided weighted Sobolev spaces* at Local and Nonlocal Trends in Analysis and Geometry, Pittsburgh, PA. October 2019
- [4] *Fractional derivatives and Laplacians in one and two-sided weighted Sobolev spaces* at SIAM Conference on Computational Science and Engineering, Spokane, WA. February 2019
- [5] *Fractional PDEs for materials modeling* at ORPA Research Symposium, Oak Ridge National Laboratory, TN. August 2018
- [6] *Investigating the dependence of transmission rate to water temperature in a host-parasite system* at Midwest Mathematical Biology Conference, University of Wisconsin–La Crosse, WI. May 2015
- [7] *Investigating the dependence of transmission rate to water temperature in a host-parasite system* at Joint Mathematics Meeting, San Antonio, TX. January 2015

- [8] *Investigating the dependence of transmission rate to water temperature in a host-parasite system* at Summer Research Expo, University of Wisconsin–La Crosse, WI. August 2014

CONFERENCE  
ATTENDANCE

- [1] 16th U.S. National Congress on Computational Mechanics, Chicago (USA), July 2021 - upcoming
- [2] The 50th John H. Barrett Memorial Lectures, Knoxville, TN. May 2020 - upcoming (postponed)
- [3] Texas Differential Equations Conference, Austin, TX. March 2020
- [4] Workshop on Experimental and Computational Fracture Mechanics, Baton Rouge, LA. February 2020
- [5] Young Researchers Minisymposium, Onna, Okinawa, Japan. February 2020
- [6] Joint Mathematics Meetings, Denver, CO. January 2020  
AWM Workshop participant
- [7] SIAM Central States Section, Ames, IA. October 2019
- [8] Local and Nonlocal Trends in Analysis and Geometry, Pittsburgh, PA. October 2019
- [9] Midwest Geometry Conference 2019, Ames, IA. September 2019
- [10] 7th Midwest Women in Mathematics Symposium, Iowa City, IA. April 2019
- [11] SIAM Conference on Computational Science and Engineering, Spokane, WA. February 2019  
AWM Workshop participant
- [12] AMS Sectional Meeting, University of Michigan, MI. October 2018
- [13] NSF CBMS Conference on Harmonic Analysis: Smooth and Non-Smooth, Iowa State University, IA. June 2018
- [14] Rivière-Fabes Symposium, University of Minnesota, MN. May 2018
- [15] Midwest Women in Mathematics Symposium, Purdue University, IN. April 2018
- [16] February Fourier Talks, University of Maryland, MD. February 2018
- [17] Nonlocal School on Fractional Equations, Iowa State University, IA. August 2017
- [18] Iowa Nebraska Functional Analysis Seminar, Creighton University, NE. April 2017
- [19] Workshop on Noncommutative Analysis, University of Iowa, IA. June 2016
- [20] Thematic Program on Boundaries and Dynamics, Undergraduate Summer School, University of Notre Dame, IN. May 2015
- [21] Midwest Mathematical Biology Conference, University of Wisconsin–La Crosse, WI. May 2015
- [22] Wisconsin MAA Section Meeting, Ripon College, TX. April 2015
- [23] Joint Mathematics Meetings, San Antonio, TX. January 2015

TEACHING  
EXPERIENCE

**The University of Texas at Austin**

M 428L: Adv. Calculus for Applications II	120 students	Spring 2021
M 408L: Integral Calculus (flipped classroom)	32 students	Fall 2020

**Iowa State University**

Math 554: Stochastic Proc.	Grader	Fall 2019
Math 519: Applied Math I	Grader	Fall 2019
Math 267: Elementary Diff. Eqs. & Laplace Transforms	Sole Instructor (15 students)	Summer 2019
Math 266: Elementary Diff. Eqs.	Sole Instructor (3 students)	Summer 2019
Math 166: Calculus II	Sole Instructor (35 students)	Spring 2018
Math 165: Calculus I	Team-Based Learning TA	Fall 2017
Math 166: Calculus II	Sole Instructor (35 students)	Summer 2017
Math 365: Complex Variables	Grader	Spring 2017
Math 105: Intro to Math Ideas	Grader	Spring 2017
Math 160: Survey of Calculus	Teaching Assistant	Fall 2016
Math 265: Calculus III	Grader	Summer 2016
Math 143: Pre-Calculus	Grader	Summer 2016
Math 265: Calculus III	Teaching Assistant	Spring 2016
Math 166: Calculus II	Teaching Assistant	Fall 2015

**University of Wisconsin-La Crosse**

Mathematics Tutor	Fall 2013 - Spring 2015
Young Scholars Teaching Assistant	July 14-18, 2014

TEACHING  
DEVELOPMENT

Team Based Learning Curriculum Assistant	Fall 2018–Spring 2019
Funded through the Howard Hughes Medical Institute grant	
Goal: Develop Team Based Learning material for non-TBL instructors to implement active learning in non-TBL classes	
Teaching Seminar on the Book <i>Make It Stick - The Science of Successful Learning</i> by Peter C. Brown	
Co-leader of seminar	Spring 2019
Participant of seminar	Spring 2017

PROFESSIONAL  
SERVICE

Referee for peer-reviewed journals	
◊ Rocky Mountain Journal of Mathematics	
Center for Minorities in the Mathematical Sciences	
◊ Research assistantship under the supervision of Michael Young to develop content for the CMMS website: <a href="http://minoritymath.org">minoritymath.org</a>	Summer 2020
Junior Analysis Seminar	
◊ Co-founder and co-organizer	2019-2020
◊ Seminar at Iowa State for graduate students interested in analysis	
Midwest Geometry Conference 2019 at Iowa State	September 2019
◊ Assisted with registration and organization	
Sonia Kovalevsky Mathematics Day at Iowa State	March 2019

◇ Assisted with student activities and organization

Midwest Mathematics Inclusion and Diversity Workshop for Undergraduates

◇ Organizing committee October 2018  
 ◇ <https://sites.google.com/iastate.edu/mmidwu18/>

Joint EDGE/AWM-MOCA Speaker Series Organization Committee

◇ Co-founder and Chair 2017 - 2019  
 ◇ <https://orion.math.iastate.edu/jamss/>

Math Graduate Student Organization

◇ Treasurer 2016 - 2017  
 ◇ Graduate Student Liaison 2017 - 2018

Association for Women in Mathematics (AWM) - Iowa State Chapter

◇ Co-founder and member November 2017 - present  
 ◇ Interim Secretary November 2017 - February 2018  
 ◇ Member of Program and Events Committee November 2017 - August 2018

Great Plains Math League Competition volunteer February 2016, 2017

First-year graduate peer mentor, Iowa State University Summer 2016 - present

#### GRADUATE COURSEWORK

<input type="checkbox"/> Abstract Algebra I, II	<input type="checkbox"/> Linear Algebra
<input type="checkbox"/> Complex Variables	<input type="checkbox"/> Methods of Applied Math I, II
<input type="checkbox"/> Continuum Mechanics (Engineering)	<input type="checkbox"/> Partial Differential Equations I, II
<input type="checkbox"/> Early Graduate Research	<input type="checkbox"/> Real Analysis I, II
<input type="checkbox"/> Functional Analysis	<input type="checkbox"/> Regularity Theory for Elliptic PDEs
<input type="checkbox"/> Introduction to Stochastic Processes	

#### RELEVANT SKILLS

Elementary MatLab and Mathematica

#### MEMBERSHIPS

American Mathematical Society  
 Association for Women in Mathematics  
 Mathematical Association of America  
 National Postdoctoral Association  
 Society for Industrial and Applied Mathematics  
 SIAM Activity Group on Analysis of Partial Differential Equations

#### OTHER

Certified Completion of Green Dot Bystander Training February 2018  
 ◇ Training to enhance influence to address power-dominated violence

Summer Lifeguard 2009 - 2015  
 ◇ More than 10 active saves  
 ◇ Swim lesson instructor for 5 years

Martial Arts

◇ Black Belt in Karate  
 ◇ Blue Belt in Taekwondo

## REFERENCES

**Pablo Raúl Stinga** (stinga@iastate.edu, 515-294-6420)

Assistant Professor,

Department of Mathematics, Iowa State University

*Ph.D. Advisor*

**Pablo Seleson** (selesonpd@ornl.gov, 865-576-2856)

Research Scientist,

Computer Science and Mathematics Division, Oak Ridge National Laboratory

**Paul Sacks** (psacks@iastate.edu, 515-294-8143)

Professor of Mathematics,

Department of Mathematics, Iowa State University

**Heather Bolles** (hbolles@iastate.edu, 515-294-8465)

Senior Lecturer,

Department of Mathematics, Iowa State University

*Teaching Reference*