

SARAH G. RAYNOR

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Current Position

Associate Chair, Department of Mathematics and Statistics, Wake Forest University, 2011-2013; 2014–.
Program Director, MA Program in the Department of Mathematics and Statistics, Wake Forest University, 2017–.
Associate Professor, Department of Mathematics and Statistics, Wake Forest University 2010–. (Assistant Professor 2004-2010.)

Previous Position

Postdoctoral Fellow, The Fields Institute for Research in the Mathematical Sciences and The University of Toronto, Fall 2003-Spring 2004.

Education

1998-2003 Massachusetts Institute of Technology:
Ph.D. June 2003, in Mathematics
Thesis title: Regularity of Neumann Solutions to a Free Boundary Problem
Thesis advisor: David Jerison
1994-1998 Yale University:
B.S. May 1998, *Summa cum laude* with Exceptional Distinction in Mathematics and Distinction in Physics
Undergraduate thesis title: Modeling Sonoluminescence
Undergraduate thesis advisor: Alan Chodos

Research Interests

Partial Differential Equations: Semilinear dispersive PDEs: questions of well-posedness and qualitative behavior.
Free boundary problems: regularity of the solution and its interface.
Semilinear elliptic PDEs: Existence of positive solutions.

Peer-Reviewed Publications

- (1) B. Pigott and S. Raynor, "Asymptotic Stability for KdV Solitons in Weighted H^s Spaces," *Comm. Pure Appl. Anal.*, **16** (2017), 393-416.
- (2) J. Marzuola, S. Raynor, and G. Simpson, "Nonlinear Bound States in a Schrödinger-Poisson System with External Potential," *SIAM J. on Appl. Dyn. Systs.*, **16** (2017), 226-251.
- (3) B. Pigott and S. Raynor, "Asymptotic Stability for KdV Solitons in Weighted Spaces via Iteration," *Illinois J. Math.*, **58** (2014), 443-470.
- (4) P. Moon, J. Muday, S. Raynor, J. Schirillo, R. Taylor, and M. Fairbanks, "Fractal Images Produce Fractal Pupillary Dilations," *International Journal of Psychophysiology*, **93** (2014) 316-321.
- (5) J. Marzuola, S. Raynor, and G. Simpson, "Dynamics Near the Minimal Mass Soliton for the Korteweg-deVries Equation," *Dyn. Syst.*, **29** (2014), 285-299
- (6) M. Chhetri, S. Raynor, and S. Robinson, "On the Existence of Multiple Positive Solutions to Some Superlinear Systems," *Proc. Roy. Soc. Edinburgh Sect. A*, **142** (2012), 39-59.
- (7) J. Marzuola, S. Raynor, and G. Simpson, "A System of ODEs for a Perturbation of a Minimal Mass Soliton," *J. Nonlinear Sci.*, **20** (2010), 425-461.
- (8) S. Raynor, "Neumann fixed boundary regularity for an elliptic free boundary problem," *Comm. Partial Differential Equations* **33** (2008), 1975-1995.
- (9) M. Chhetri, P. Drabek, S. Raynor, and S. Robinson, "Nonvariational Problems with Critical Growth," *Nonlinear Anal.* **68** (2008), 2092-2103.
- (10) J. Colliander, S. Raynor, C. Sulem, and J. D. Wright, "Ground State Mass Concentration in the L^2 -Critical Nonlinear Schrödinger Equation Below H^1 ," *Math. Res. Lett.* **12** (2005), 357-375.
- (11) S. Raynor and G. Staffilani. "Low Regularity Stability of Solitons for the KdV Equation", *Comm. Pure Appl. Anal.* **2** (2003), 277-296.
- (12) A. Chodos and S. Groff, "Modeling Sonoluminescence," *Phys. Rev. E*, **59** (1999), 3001-3007.

Articles Submitted for Publication

- (1) J. Gemmer, G. Moon, and S. Raynor, "Solutions to a Two-Dimensional, Neumann Free Boundary Problem," submitted to *J. Math Anal. Appl.*
- (2) T. Luo and S. Raynor, "Modeling Traffic with Human Variation," submitted to *The Pi Mu Epsilon Journal*.

Articles Under Preparation

- (1) Y. Ma, J. Raynor, and S. Raynor, "The effect of annexation on the fractal dimension of city boundaries."
- (2) P. Moon, J. Muday, S. Raynor, J. Schirillo, M.S. Fairbanks, and R. P. Taylor, "The Pupil Obeys a Temporal Fractal Pattern."

Book Submitted for Publication

- (1) S. Raynor and S. Robinson, Analysis on Metric Spaces: A First Graduate Analysis Text, submitted to the Dolciani series of the MAA Press, 181 pp.

Invited Research Talks (Past Five Years)

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| April 2017 | Cornell Analysis Seminar, Ithaca, NY |
| November 2016 | Special Session on Nonlinear Boundary Value Problems, AMS Southeastern Sectional Meeting, Raleigh, NC |
| October 2016 | Colloquium, Wofford College Mathematics Department, Spartanburg, SC |
| December 2015 | Mini-Symposium on Coherent Structures in Hamiltonian PDE
SIAM Conference on Analysis of Partial Differential Equations, Scottsdale, AZ |
| July 2015 | Principal Lecturer, DC summer workshop in PDE, George Washington University, Washington, D.C. |
| April 2015 | Special Session on Applications of Continuous and Discrete Integrable Systems, IMACS Waves Conference, Athens, GA |
| March 2015 | Special Session on Recent Progress in Differential Equations, AMS Southeastern Sectional Meeting, Huntsville, AL |
| March 2015 | Special Session on Harmonic Analysis and Partial Differential Equations, AMS Central Sectional Meeting, East Lansing, MI |
| April 2014 | Drexel University Partial Differential Equations and Applied Math Seminar, Philadelphia, PA |
| February 2014 | George Washington University Colloquium, Washington, DC |
| February 2014 | UNCG Applied Math Seminar, Greensboro, NC |
| January 2014 | Special Session on Advances in Analysis and PDEs, Joint Mathematical Meetings, Baltimore, MD |
| December 2013 | Minisymposium on Dynamics of Nonlinear Dispersive Wave Equations, 2013 SIAM Conference on Analysis of Partial Differential Equations, Orlando, FL |
| October 2013 | Special Session on Nonlinear Elliptic and Wave Equations and Applications, AMS Eastern Sectional Meeting, Philadelphia, PA |
| June 2013 | Special Session on Nonlinear Partial Differential Equations and their Applications, CMS Summer Meeting, Halifax, NS, Canada |
| March 2013 | Special Session on Quasilinear and Dispersive Partial Differential Equations, IMACS Waves Conference, Athens, GA |
| March 2012 | Special Session on Nonlinear Dispersive Equations, AMS Eastern Section Meeting, Washington, DC |
| January 2012 | Special Session on Reaction Diffusion Equations and Applications, Joint Mathematical Meetings, Boston, MA |

Contributed Research Talks (Past Five Years)

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| June 2017 | Flash Presentation: French-American Conference on Nonlinear Dispersive Equations, CIRM Marseille, France |
| October 2013 | Southeast Atlantic Regional Conference in Diff. Equations (SEARCDE), University of Tennessee Knoxville |

Other Conference Activities (Past Five Years)

- January 2015– MAA Minicourse monitor and committee member, JMM and Mathfest
 June 2017 Invited Participant, French-American Conference on Nonlinear Dispersive PDEs, CIRM, Marseille, France
 March 2017 Organizer, Special Session on Advances in long-term behavior of nonlinear dispersive equations, AMS Spring Southeastern Section meeting, Charleston, SC
 March 2016 Program chair, MAA Southeastern Section annual meeting, Birmingham, AL
 March 2015 Program chair, MAA Southeastern Section annual meeting, Wilmington, NC
 March 2014 Program chair, MAA Southeastern Section annual meeting, Cookeville, TN
 October 2012 Organizing Committee, Southeastern Atlantic Regional Conference in Differential Equations

Courses Taught (Past Five Years)

- Fall 2017 Math 311 (Introductory Real Analysis I; two sections) and Math 712 (Real Analysis II)
 Summer 2017 Math 383 (Advanced Topics in Mathematics)
 Spring 2017 Math 311 and Math 711 (Real Analysis I)
 Fall 2016 Math 111 (Calculus with Analytic Geometry 1; course committee chair), Math 165 (Problem Solving Seminar, voluntary overload)
 Spring 2016 Math 214 (Multivariable Analysis; new course) and Math 311
 Fall 2015 Math 113 (Multivariable Calculus) and Math 121 (Linear Algebra)
 Spring 2015 Math 758 (Topics in Probability and Statistics), Math 711, and Math 311; Math 682 reading course in analysis for one student
 Fall 2014 Math 113 and Math 121
 Spring 2013 Math 112 (Calculus with Analytic Geometry 2), three sections
 Fall 2012 Math 731 (General Topology), Math 311/611, and Math 682 (A Measure Theory reading course; overload)
 Summer 2012 "Solitons," George Washington University Summer Program for Women in Mathematics
 Spring 2012 Math 758 and Math 711

Other Invited Presentations (Past Five Years)

- July 2017 North Carolina Governor's School guest speaker
 June 2016 North Carolina Governor's School guest speaker
 July 2015 North Carolina Governor's School guest speaker
 June 2014 North Carolina Governor's School guest speaker
 November 2013 Guest Presenter, Math Teacher's Circle, Wake Forest University
 August 2013 Guest Presenter, Math Teacher's Circle, Wake Forest University
 June 2013 North Carolina Governor's School guest speaker
 March 2013 Panel member, "Graduate School and Beyond," MAA Southeastern Section annual meeting, Rock Hill, SC
 June 2012 North Carolina Governor's School guest speaker

Fellowships and awards (Past Five Years)

- Participant, Mid-Career Faculty Development Program, Wake Forest College, 2016
 Simons Foundation Collaboration Grant recipient, 2012-2018
 Postdoctoral Mentor of the Year, Wake Forest University, 2011-2012

Advising (Past 5 Years)

Fall 2017	Supervising one senior thesis and one additional undergraduate research project
Summer 2017	Supervised one Wake Forest Research Fellow and one additional undergraduate summer research project (unfunded).
Academic Year 2016-2017	Supervised two senior theses and advising 19 majors.
Summer 2016	Supervised one Wake Forest Research Fellow and one additional undergraduate summer research project (unfunded).
Academic Year 2015-2016	Supervised one Masters thesis, serving on one additional thesis committee; advising 22 majors.
Academic Year 2014-2015	Supervised one first-year Masters student and one senior project; advised 21 majors.
Academic Year 2013-2014	(on research leave) Supervised one Masters thesis, and one senior project; served on one additional thesis committee.
Summer 2013	Co-supervised two Summer Research Fellowships.
Academic Year 2012-2013	Served on four thesis committees and advised 13 major advisees.
Summer 2012	Supervised one Summer Research Fellowship.
Academic Year 2011-2012	Co-supervised one Masters thesis, served on two additional thesis committees, and advised 10 lower-division advisees, 6 majors, and 2 minors.

Service to the Department

Academic Year 2017-2018	Associate Chair of Department (includes course scheduling, administration of non-standard courses, and other duties); Program Director, graduate program; member, hiring committee; member, teaching committee.
Academic Year 2016-2017	Associate Chair of Department; Vice Chair, graduate committee; member, hiring committee; member, service committee; member, postdoctoral committee; postdoctoral mentor for Jason Gaddis.
Academic Year 2015-2016	Associate Chair of Department; Chair, teaching professional committee (to determine the potential role of this type of position in our department and our hiring goals); member, departmental review committee (for ten-yearly departmental program review); member, hiring committee; member, graduate committee; editor, department newsletter; postdoctoral mentor for Jason Gaddis.
Academic Year 2014-2015	Associate Chair of Department; Chair, Hiring committee (for two tenure-track positions and one visitor); member, graduate committee; member, library committee; member, department review committee; postdoctoral mentor for Jason Gaddis.
Academic Year 2013-2014	On Research Leave.
Academic Year 2012-2013	Associate Chair of Department; Chair, Postdoctoral hiring and administration committee; member, undergraduate curriculum committee; member, analysis reform committee; member, library committee.
Academic Year 2011-2012	Associate Chair of Department; Chair, Postdoc committee; member, hiring committee; member, library committee.

Service to the University

Academic Year 2017-2018	Chair, Senate Ad Hoc Committee on Centers and Institutes; Member, College Ad Hoc Curriculum Review Committee; Faculty Advisor, WFU Rosenblatt Hillel.
Summer 2017	Team member, Institute on Project Based Learning, Worcester Polytechnic Institute
Academic year 2016-2017	Chair, Committee of Collegiate Senators; Member, Curricular Best Practices Task Force.
Academic year 2015-2016	Faculty Senate.
Academic year 2014-2015	Committee on Academic Planning, Faculty Senate.
Academic year 2012-2013	Committee on Academic Planning
Academic year 2011-2012	Committee on Academic Planning, Honor and Ethics Council

Additional Service to the Profession

September 2016-present	Mentor, National Alliance for Doctoral Studies in the Mathematical Sciences
September 2015-August 2016	Consultant, Project NExT
January 2015-present	MAA Minicourse committee
Spring 2013-Spring 2016	Vice Chair for Programs, MAA Southeastern Section.
Fall 2008-Spring 2013	Newsletter Editor and Executive Committee member, MAA Southeastern Section.
Ongoing	NSF grant review panelist
Ongoing	Referee for several peer-reviewed journals, and Mathematical Reviews reviewer

Memberships

American Mathematical Society.

Association for Women in Mathematics.

Mathematical Association of America..

Phi Beta Kappa. Undergraduate Secretary, Yale University Chapter, 1997–1998.

Pi Mu Epsilon

Society for Industrial and Applied Mathematics.