

# Geordie Richards

 [www.geordierichards.com](http://www.geordierichards.com)

## Employment

- 2021-present **Adjunct Associate Professor**,  
*Department of Mathematics and Statistics, Hunter College,*  
New York City, NY, USA.
- 2016–2021 **Assistant Professor**,  
*Department of Mechanical and Aerospace Engineering, Utah State University,*  
Logan, UT, USA.
- 9/2015–  
11/2015 **Research Member**, *Mathematical Sciences Research Institute,*  
Berkeley, CA, USA.
- 2013–2016 **Visiting Assistant Professor**,  
*Department of Mathematics, University of Rochester,*  
Rochester, NY, USA.
- 2012–2013 **Postdoctoral Research Fellow**, *Institute for Mathematics and its Applications,*  
Minneapolis, MN, USA.

## Education

- 2007–2012 **Ph. D.**, *University of Toronto*, Toronto, ON, Canada.  
Mathematics
- 2006–2007 **M. Sc.**, *University of Toronto*, Toronto, ON, Canada.  
Mathematics
- 2001–2005 **Hon. B. Sc.**, *University of Toronto*, Toronto, ON, Canada.  
Mathematics specialist - *with high distinction*

## Doctoral Thesis

- Title *Maximal-in-time behaviour of deterministic and stochastic dispersive PDEs*  
Advisors James Colliander (University of British Columbia) and Tadahiro Oh (Edinburgh University)

## Research Interests

Deterministic and stochastic nonlinear PDEs, harmonic and functional analysis, probability theory, dynamical systems, fluid mechanics, turbulence, estimation theory, uncertainty quantification.

## Publications

### Published Journal Articles

- [1] J. Földes, N.E. Glatt-Holtz, and G. Richards. “Large Prandtl number asymptotics in randomly forced turbulent convection.” *Nonlinear Differential Equations and Applications NoDEA* **26** (2019). Available at <http://arxiv.org/abs/1504.02904>.
- [2] B.L. Smith, D.R. Neal, M.A. Feero, and G. Richards. “Assessing the limitations of the effective number of samples for finding the uncertainty of the mean of correlated data.” *Measurement Science and Technology* **29**, 125204 (2018).
- [3] J. Földes, S. Friedlander, N.E. Glatt-Holtz, and G. Richards. “Asymptotic analysis for

randomly forced MHD." *SIAM Journal on Mathematical Analysis* **49**, 4440–4469 (2017). Available at <https://arxiv.org/abs/1604.06352>.

- [4] N.E. Glatt-Holtz, J.C. Mattingly, and G. Richards. "On unique ergodicity in nonlinear stochastic partial differential equations." *Journal of Statistical Physics* **166**, 1–24 (2017). Available at <http://arxiv.org/abs/1512.04126>.
- [5] J. Földes, N.E. Glatt-Holtz, G. Richards, and J. Whitehead. "Ergodicity in randomly forced Rayleigh-Bénard convection." *Nonlinearity* **29** (2016). Available at <http://arxiv.org/abs/1511.01247>.
- [6] T. Oh, G. Richards, and L. Thomann. "On invariant Gibbs measures for the generalized KdV equations." *Dynamics of Partial Differential Equations* **13**, 133–153 (2016). Available at <http://arxiv.org/abs/1509.06873>.
- [7] G. Richards. "Invariance of the Gibbs measure for the periodic quartic gKdV." *Annales de l'Institut Henri Poincaré (C) Analyse non linéaire* **33**, 699–766 (2016). Available at <http://arxiv.org/abs/1209.4337>.
- [8] J. Földes, N.E. Glatt-Holtz, G. Richards, and E. Thomann. "Ergodic and mixing properties of the Boussinesq equations with a degenerate random forcing." *Journal of Functional Analysis* **269**, 2427–2504 (2015). Available at <http://arxiv.org/abs/1311.3620>.
- [9] G. Richards. "Well-posedness of the stochastic KdV-Burgers equation." *Stochastic Processes and their Applications* **124**, 1627–1647 (2014). Available at <http://arxiv.org/abs/1109.4926>.
- [10] G. Richards. "Mass Concentration for the Davey-Stewartson System." *Differential and Integral Equations* **24**, 261–280 (2011). Available at <http://arxiv.org/abs/0909.0492>.

#### Submitted Journal Articles

- [11] N. Glatt-Holtz, V. Martinez, and G. Richards. "On the long-time statistical behavior of smooth solutions of the weakly damped, stochastically-driven KdV equation." (2021). Available at <https://arxiv.org/abs/2103.12942>.
- [12] Z. Pan, J. Whitehead, G. Richards, T. Truscott, and B. Smith. "Error propagation dynamics of PIV-based pressure calculation (3): length scale effects." (2018). Available at <https://arxiv.org/abs/1807.03958>.
- [13] J. Földes, N.E. Glatt-Holtz, G. Richards, and J. Whitehead. "Hydrodynamic stability in the presence of a stochastic forcing: a case study in convection." (2017). Available at <https://arxiv.org/abs/1704.03840>.

#### Expository Articles

- [14] C. Mueller and G. Richards. "Can solutions of the wave equation with nonlinear multiplicative noise blow-up?" *Open Problems in Mathematics* **2**, 1–4 (2014). Available at <http://opmath.org/index.php/opm/article/view/9>.

#### Ph.D. Thesis

- [15] G. Richards. "Maximal-in-time behavior of solutions to deterministic and stochastic dispersive PDEs." 2012, University of Toronto, Available at <https://tspace.library.utoronto.ca/handle/1807/32973>.

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## Research Funding

### Current

- 2019 **Nuclear Regulatory Commission (NRC) Faculty Development Grant (value: \$431,628)**, *Faculty Development Program to Integrate New Faculty in Nuclear Engineering Research at Utah State University*, **Co-PI** with PI Barton Smith and Co-PI Hailei Wang (USU, Mechanical & Aerospace Engineering), June, 2019 - May, 2022.  
Participation halted due to leaving USU in 2021

### Pending

- 2020 **National Science Foundation Applied Mathematics grant (value: \$261,118.90)**, *Ergodic Theory for Deterministic and Stochastic Dispersive PDEs*, **PI**, March, 2021 - February, 2024.
- 2021 **Department of Energy (DOE) grant (value: \$800,000)**, *Dynamic Modeling, Optimization and Techno-economic Analysis of Integrated Energy Systems for Sodium Fast Reactors*, **Co-PI** with PI Hailei Wang and Co-PI Matthew Harris (USU, Mechanical & Aerospace Engineering), October, 2021 - September, 2024.

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## Research Honors and Awards

- 2016 **NSF Conference Grant (Value: \$17,875, Award #1700560)**, *Rocky Mountain Partial Differential Equations*, 1 week conference in Provo, UT, May 2017, **Co-PI** with PI Jared Whitehead, and Co-PIs Mark Allen and Blake Barker.
- 2016 **Research in Groups grant**, *Banff International Research Station, Canada*, 1 week research visit, with Nathan Glatt-Holtz, Juraj Földes and Jared Whitehead.
- 2015 **MSRI Research Membership**, *Program on New Challenges in PDE: Deterministic Dynamics and Randomness in High and Infinite Dimensional Systems*, September 1, 2015 - November 1, 2015.
- 2015 **Research in Peace grant**, *Mathematical Research Institute of Oberwolfach, Germany*, 3 week research visit, with Nathan Glatt-Holtz, Juraj Földes and Susan Friedlander.
- 2014 **Research in Pairs grant**, *Mittag-Leffler Institute, Sweden*, 3 week research visit, with Nathan Glatt-Holtz, Juraj Földes and Enriquet Thomann.
- 2012 **IMA Postdoctoral Fellowship**, *Program on Infinite Dimensional and Stochastic Dynamical Systems*, September 1, 2012 - August 1, 2013.
- 2007-2010 **Ontario Graduate Scholarship.**
- 2006 **Natural Sciences and Engineering Research Council Graduate Scholarship.**
- 2005 **Samuel Beatty Scholarship.**
- 2004,2005 **Innis College Academic Excellence Award.**

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## Teaching Awards

- 2019 **Mechanical & Aerospace Engineering Teacher of the Year**, *Utah State University.*
- 2015 **Professor of the Year Award nominee**, *University of Rochester.*
- 2011 **Engineering faculty TA award finalist**, *University of Toronto.*
- 2009 **Daniel B. Delury teaching award**, *Used to recognize the best TAs in the University of Toronto Mathematics department..*

## Teaching Experience

### Research Advisor

2016-present **Major Advisor**, 2 *Ph.D. students* (*Louis Tonc, Jacob Bryan*), 1 *M.S. student* (*Joseph James, graduated 2019*), 2 *Undergraduate Research Assistants* (*Matt DeFriez, Jacob Needham*).

Presentations by students:

1. "Monte Carlo Methods and Skewed Kalman Filters for State Determination", by L. Tonc, 2018 AAS/AIAA Astrodynamics Conference, Snowbird, UT, Aug. 2018.
2. "Efficiency Analysis for a Novel Expander Design", by J. James, 2018 USU Student Research Symposium, Logan, UT, April 2018.

Summer 2013 **MAXIMA REU project (NSF funded, Award #1156701): Recognizing and segmenting barcodes in images**, *Institute for Mathematics and its Applications*, Joint with T. Hoft (University of St. Thomas) guided a research project involving four undergraduate students,

Students: Mikaela Cashman (Coe College '14, UNL CompSci Ph.D.), Keenan Hawekotte (Nebraska Wesleyan '15), Elizabeth Newman (Haverford '14, Tufts Ph.D.), Dung Nguyen (Bard '15).

Presentations by students:

1. "Bar code localization in images using neural network and linear discriminant analysis frameworks" - D. Nguyen, Joint Mathematics Meetings, Baltimore (MD), Jan. 2014.  
- M. Cashman, SE Conference for Undergrad Women in Math, Clemson University (SC), Oct. 2013.
2. "Bar code localization using machine learning" (poster)  
- M. Cashman, K. Hawekotte, E. Newman, D. Nguyen, JMM, Baltimore (MD), Jan. 2014.  
- E. Newman, Undergraduate Science Research Symposium, Haverford College (PA), Sep. 2013

### Course Instructor

Summer 2021 **STAT 312/702 (Stochastic Processes/Advanced Probability Theory)**, *Hunter College*.

Summer 2021 **MATH 747 (Theory of Functions of a Real Variable II)**, *Hunter College*.

Spring 2018, 2019, 2020, 2021 **MAE 3210 (Engineering Numerical Methods)**, *Utah State University*.

Fall 2018, 2019, 2020 **MAE 6040 (Continuum Mechanics and Elasticity)**, *Utah State University*, graduate course.

Spring 2017, 2020, 2021 **MAE 6490 (Turbulence)**, *Utah State University*, graduate course.

Fall 2016, 2017 **MAE 6500 (Potential Flow)**, *Utah State University*, graduate course.

Spring 2016 **MTH 282 (Complex Variables)**, *University of Rochester*.

Spring 2015, 2016 **MTH 201 (Probability Theory)**, *University of Rochester*.

Fall 2014 **MTH 210H (Mathematics of Finance: Honors)**, *University of Rochester*.

Spring 2014, **MTH 235 (Linear Algebra)**, *University of Rochester*.

Summer 2015

Spring 2014, 2015, 2016 **MTH 130 (Excursions in Mathematics)**, *University of Rochester*.

Fall 2013 **MTH 263 (Qualitative Theory of ODEs)**, *University of Rochester*.

- Fall 2013, 2014 **MTH 162 (Calculus I)**, *University of Rochester*.
- Summer 2012 **MAT 334H (Complex Variables)**, *University of Toronto*.
- Summer 2012 **MAT 235Y (Calculus II)**, *University of Toronto*.
- Spring 2012 **MAT 336S (Elements of Analysis)**, *University of Toronto*.
- Fall 2011 **APM 384F (PDEs for Engineering Science)**, *University of Toronto*.
- Fall 2011 **MAT 291F (Calculus III)**, *University of Toronto*.
- 2010–2011 **MAT 235Y (Calculus II)**, *University of Toronto*.
- Summer 2010 **MAT 137Y (Calculus!)**, *University of Toronto*.
- Summer 2009 **MAT 137Y (Calculus!)**, *University of Toronto*.

#### Teaching Assistant

- Spring 2012 **APM 462S (Nonlinear Optimization)**, *University of Toronto*.
- Summer 2006, 2011 **MAT 235Y (Calculus II)**, *University of Toronto*.
- Fall 2006, Fall 2010 **MAT 1060F (Graduate PDEs I)**, *University of Toronto*.
- Spring 2010 **MAT 1700S (General Relativity)**, *University of Toronto*.
- Fall 2009 **APM 384F (PDEs for Engineering Science)**, *University of Toronto*.
- Spring 2009 **MAT 244S (Introduction to ODEs)**, *University of Toronto*.
- 2008–2009 **MAT 237Y (Multivariable Calculus)**, *University of Toronto*.
- Fall 2008 **APM 421F (Quantum Mechanics)**, *University of Toronto*.
- 2006–2008 **MAT 137Y (Calculus!)**, *University of Toronto*.
- Spring 2006 **MAT 223S (Linear Algebra I)**, *University of Toronto*.
- 2004–2006 **MAT 135Y (Calculus I)**, *University of Toronto*.

#### Public Education

- November 2016 **Guest Lecture on “An introduction to Topology” to high school audience**, *Cohen College Prep Academy, New Orleans, LA*.
- March 2013, 2014 **Guest Lectures on “An introduction to Topology” to high school audience**, *High School Math Circle at University of Rochester*.

#### Training

- Spring 2008 **MAT 1499 (Teaching Large Mathematics Classes)**, *University of Toronto*.

## Research Presentations

### Invited Conference Presentations

- October 2020 Fall Western Sectional AMS Meeting, University of Utah (virtual), *Long-time statistics of damped stochastic KdV*
- October 2020 Fall Western Sectional AMS Meeting, University of Utah (virtual), *Asymptotic coupling and unique ergodicity for damped stochastic KdV*
- September 2020 Fall Central Sectional AMS Meeting, University of Texas at El Paso (virtual), *Asymptotic coupling and unique ergodicity for damped stochastic KdV*
- September 2019 SIAM Northern States Section, University of Wyoming, *Ergodic theory for stochastic Boussinesq equations*

- March 2019 Recent Advances in Pure and Applied Stochastics, Tulane University,  
*Ergodic theory for stochastic Boussinesq equations*
- May 2018 Drexel Waves Workshop, Drexel University,  
*Ergodic theory for stochastic Boussinesq equations*
- September 2017 SIAM Central States Section, Colorado State University,  
*Ergodicity results for stochastic partial differential equations*
- April 2016 Spring Central Sectional AMS Meeting, University of Utah,  
*On invariant Gibbs measures for the generalized KdV equations*
- April 2016 Spring Central Sectional AMS Meeting, University of Utah,  
*On unique ergodicity for nonlinear stochastic PDEs*
- December 2015 SIAM Conference on Analysis of Partial Differential Equations, Scottsdale, AZ  
*On invariant Gibbs measures for the generalized KdV equations*
- December 2015 SIAM Conference on Analysis of Partial Differential Equations, Scottsdale, AZ  
*Ergodicity results for stochastic Boussinesq equations*
- August 2015 Conference on "Harmonic Analysis and Partial Differential Equations", International Center  
for Mathematical Sciences (ICMS), Edinburgh, UK,  
*Ergodicity results for stochastic Boussinesq equations*
- March 2015 Spring Central Sectional AMS Meeting, Georgetown University,  
*Ergodicity results for stochastic Boussinesq equations*
- January 2015 Informal Analysis Workshop, Texas A&M University,  
*Statistical mechanics for gKdV*
- July 2014 Australian Statistical Conference in conjunction with the Institute for Mathematical Statis-  
tics Annual Meeting, Australian Technology Park, Sydney, Australia  
*Ergodic and mixing properties of the Boussinesq Equations with a degenerate random  
forcing*
- April 2014 Spring Central Sectional AMS Meeting, Texas Tech University  
*Ergodic and mixing properties of the Boussinesq equations with a degenerate random  
forcing*
- May 2013 Conference on "Probability and PDEs" held at Centro de Giorgi, Pisa, Italy  
*Statistical mechanics for gKdV*
- March 2012 Spring Eastern Sectional AMS Meeting, George Washington University  
*Invariance of the Gibbs measure for the periodic quartic gKdV*
- Invited Seminar Presentations**
- June 2018 Analysis Seminar, University of Toronto,  
*Asymptotic Analysis for Stochastic MHD*
- November 2018 Applied Math Seminar, Utah State University  
*Invariant measures for Hamiltonian PDEs*
- March 2017 Probability Seminar, University of Utah  
*Invariant measures for Hamiltonian PDEs*
- August 2016 Colloquium, Tulane University,  
*Invariant measures for Hamiltonian PDEs*
- September 2016 Applied Math Seminar, Brigham Young University,  
*Convergence of invariant states in singular parameter limits for systems of stochastic PDEs*

- August 2016 Analysis Seminar, University of Edinburgh,  
*Convergence of invariant states in singular parameter limits for systems of stochastic PDEs*
- April 2016 Analysis Seminar, University of Toronto,  
*Ergodicity results for stochastic Boussinesq equations*
- November 2015 Analysis Seminar, Cornell University,  
*On invariant Gibbs measures for the generalized KdV equations*
- October 2015 Center for Applied Mathematical Sciences Colloquium, University of Southern California,  
*Ergodicity results for stochastic Boussinesq equations*
- July 2015 MAE Departmental Colloquium, Utah State University,  
*Invariant measures for nonlinear evolution equations*
- April 2015 Applied Math Seminar, Virginia Tech,  
*Ergodicity Results for stochastic Boussinesq Equations*
- April 2015 Probability and Financial Math Seminar, Penn State University,  
*Ergodicity Results for stochastic Boussinesq Equations*
- February 2014 Applied Math Seminar, Virginia Tech  
*Statistical Mechanics for gKdV*
- November 2013 Probability Seminar, University of Rochester  
*Ergodic and Mixing Properties of the Boussinesq Equations with a Degenerate Random Forcing*
- November 2013 Colloquium, Georgia Southern University  
*Statistical Mechanics for gKdV*
- October 2013 Analysis Seminar, University of Rochester  
*Statistical Mechanics for gKdV*
- April 2013 Analysis Seminar, Princeton University  
*Statistical Mechanics for gKdV*
- April 2013 Dynamics Seminar, Boston University  
*Invariance of the Gibbs measure for the periodic quartic gKdV*
- March 2013 Analysis and Applied Math Seminar, Duke University  
*Invariance of the Gibbs measure for the periodic quartic gKdV*
- January 2013 Stochastics Seminar, Georgia Tech  
*Invariance of the Gibbs measure for the periodic quartic gKdV*
- December 2012 IMA Postdoc Seminar, Institute for Mathematics and its Applications  
*Invariance of the Gibbs measure for the periodic quartic gKdV*
- September 2012 PDE Seminar, University of Minnesota  
*Invariance of the Gibbs measure for the periodic quartic gKdV*
- January 2012 Analysis Seminar, University of Rochester  
*Invariant measures for Hamiltonian PDEs*
- [Expository Presentations](#)
- April 2017 SIAM Student Chapter, Utah State University  
*Introduction to stochastic partial differential equations*
- April 2016 Graduate PDE Seminar, University of Toronto  
*On Unique Ergodicity for Stochastic PDEs*
- February 2013 Dispersive PDEs Seminar, University of Toronto  
*Statistical Mechanics for Hamiltonian PDEs*

- September 2011 Graduate Student Seminar, University of Toronto  
*Probabilistic Cauchy theory and invariant measures for Hamiltonian PDEs*
- June 2011 Dispersive PDEs seminar, University of Toronto  
*Function spaces for critical well-posedness theory*
- October 2010 Dispersive PDEs seminar, University of Toronto  
*Invariant Gibbs measures for periodic nonlinear Schrödinger equations (Part II)*
- September 2010 Fields Analysis Working Group, Fields Institute, Toronto, Canada  
*Invariant Gibbs measures for periodic nonlinear Schrödinger equations (Part I)*
- June 2010 Dispersive PDEs seminar, University of Toronto  
*Invariant measures for Hamiltonian PDEs*
- April 2010 Fields Analysis Working Group, Fields Institute, Toronto, Canada  
*Local well-posedness of the stochastic KdV-Burgers equation*
- February 2009 Dispersive PDEs seminar, University of Toronto  
*Critical local well-posedness and perturbation theory*
- July 2009 Dispersive PDEs Seminar, University of Toronto  
*The classical limit of mean field quantum systems*
- December 2008 Fields Analysis Working Group, Fields Institute, Toronto, Canada  
*The Tomas-Stein restriction Theorem*
- October 2008 Dispersive PDEs Seminar, University of Toronto  
*Log-log blowup solutions to  $L^2$ -critical NLS*
- November 2006 Fields Analysis Working Group, Fields Institute, Toronto, Canada  
*Classification of minimal mass blow-up solutions to the  $L^2$ -critical NLS*

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## Service

- 2020-present Joint USU/BYU PDE/Applied Math Seminar  
*Co-organizer of meetings held on Zoom*
- 2020-present USU SEDS (Students for the Exploration and Development of Space) club  
*Faculty Advisor*
- 2019-present APS Division of Fluid Dynamics 2024 Meeting, Salt Lake City, UT  
*Co-organizer of meeting to be held at University of Utah*
- 2016-present Committee member on 11 Ph.D. and 12 M.S. committees in MAE department
- 2016-present MAE undergraduate curriculum committee, Utah State University
- 2017 MAE hiring committee, Utah State University
- July 2017 Mathematical Congress of the Americas, Montreal, Canada  
*Organizer of special session on "Nonlinear and Stochastic Partial Differential Equations"*
- June 2017 Probabilistic Perspectives in Nonlinear PDEs, Edinburgh, UK  
*Co-organizer of NSF funded conference (\$30,000, Award #1700124) held at the International Centre for Mathematical Sciences, with Susan Friedlander, Nathan Glatt-Holtz, Oana Pocovnicu, and Tadahiro Oh*
- May 2017 Rocky Mountain Partial Differential Equations, Provo, UT  
*Co-organizer of NSF funded conference (\$17,875, Award #1700560) with Mark Allen, Blake Barker and Jared Whitehead*



- May 2017 Spring Eastern Sectional AMS Meeting, Hunter College  
*Organizer for special session on "Nonlinear and Stochastic Partial Differential Equations: Theory and Applications in Turbulence and Geophysical Flows"*
- October 2016 Fall Western Sectional AMS Meeting, University of Denver  
*Organizer for special session on "Nonlinear and stochastic partial differential equations"*
- October 2014 Fall Western Sectional AMS Meeting, San Francisco State University  
*Organizer for special session on "Nonlinear PDEs"*
- April 2014 Spring Western Sectional AMS Meeting, University of New Mexico  
*Organizer for special session on "Stochastics and PDEs"*

#### Referee for

- SIAM Journal on Mathematical Analysis
- Journal of Mathematical Analysis and Applications
- Proceedings of the Royal Society of Edinburgh, Section A
- Canadian Mathematical Bulletin
- Communications in Pure and Applied Analysis
- Discrete and Continuous Dynamical Systems, Series A
- Journal of Mathematical Physics
- Nonlinear Analysis Series A: Theory, Methods and Applications

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## References

### Research

- **James Colliander**,  
Professor and Director of Pacific Institute of the Mathematical Sciences,  
Department of Mathematics, University of British Columbia,  
*E-mail: colliand@math.ubc.ca.*
- **Jonathan Mattingly**,  
James B. Duke Distinguished Professor and Chair, Department of Mathematics,  
Duke University,  
*E-mail: jonm@math.duke.edu.*
- **Tadahiro Oh**,  
Professor, School of Mathematics, University of Edinburgh,  
*E-mail: hiro.oh@ed.ac.uk.*
- **Jeremy Quastel**,  
Professor and Chair, Department of Mathematics, University of Toronto,  
*E-mail: quastel@math.toronto.edu.*

### Teaching

- **Mark Herman**,  
Director of Undergraduate Studies in Mathematics, University of Rochester,  
*E-mail: herman@math.rochester.edu.*
- **Catherine Sulem**,  
Professor, Department of Mathematics, University of Toronto,  
*E-mail: sulem@math.toronto.edu.*