# Miles H. Wheeler

## Contact information


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| mw2319@bath.ac.uk | Department of Mathematical Sciences |
| www.mileshwheeler.com | University of Bath |
| Citizenship: USA | Bath BA2 7AY, United Kingdom |


## Employment

Department of Mathematical Sciences, University of Bath: September 2019–present
Lecturer (Assistant Professor)

Faculty of Mathematics, University of Vienna: 2017–2019
University Assistant (6 year non-tenure-track position)

Courant Institute of Mathematical Sciences, New York University: 2014–2017
Supported by NSF Mathematical Sciences Postdoctoral Fellowship

## Education

Brown University: Providence, Rhode Island, 2009–2014
Ph.D. in Mathematics, May 2014
M.S. in Applied Mathematics, May 2012
Advisor: Walter Strauss

Cornell University: Ithaca, New York, 2005–2009
B.A. in Mathematics and Physics, summa cum laude

## Research interests

Nonlinear partial differential equations, fluid mechanics, water waves, bifurcation theory

## Publications and preprints

Preprints available at www.mileshwheeler.com

1. R.M. Chen, K. Varholm, S. Walsh, and M.H. Wheeler, Vortex-carrying solitary gravity waves of large amplitude, submitted (38 pages).
2. J. Sewell, K Matthies, and M.H. Wheeler, Solitary solutions to the steady Euler equations with piecewise constant vorticity in a channel, *J. Differential Equations* 400:376, 2024 (47 pages).
3. R.M. Chen, S. Walsh, and M.H. Wheeler, Desingularization and global continuation for hollow vortices, submitted (49 pages).
4. R.M. Chen, L. Fan, S. Walsh, and M.H. Wheeler, Rigidity of three-dimensional internal waves with constant vorticity, *J. Math. Fluid Mech.* 25:71, 2023 (13 pages).
5. R.M. Chen, S. Walsh, and M.H. Wheeler, Global bifurcation for monotone fronts of elliptic equations, to appear in *J. Eur. Math. Soc.* (60 pages).
6. S.V. Haziot and M.H. Wheeler, Large-amplitude steady solitary water waves with constant vorticity, *Arch. Rational Mech. Anal.* 247:27, 2023 (49 pages).
7. S.V. Haziot, V.M. Hur, W.A. Strauss, J.F. Toland, E. Wahlén, S. Walsh, and M.H. Wheeler, Traveling water waves — the ebb and flow of two centuries, *Quart. Appl. Math.* 80:317, 2022 (85 pages).
8. V.M. Hur and M.H. Wheeler, Overhanging and touching waves in constant vorticity flows, *J. Differential Equations* 338:572, 2022 (19 pages).

9. Z. Hassainia and M.H. Wheeler, Multipole vortex patch equilibria for active scalar equations, *SIAM J. Math. Anal.* 54(6):6054, 2022 (42 pages).
10. M.A. Johnson, T. Truong, and M.H. Wheeler, Solitary waves in a Whitham equation with small surface tension, *Stud. Appl. Math.* 148(2):773, 2022 (40 pages).
11. R.M. Chen, S. Walsh, and M.H. Wheeler, Large-amplitude internal fronts in two-fluid systems, *C. R. Math. Acad. Sci. Paris* 358(9-10):1073, 2020 (11 pages).
12. V.S. Krishnamurthy, M.H. Wheeler, D.G. Crowdy, and A. Constantin, Liouville chains: new hybrid vortex equilibria of the two-dimensional Euler Equation, *J. Fluid Mech.* 921:A1, 2021 (35 pages).
13. T. Truong, E. Wahlén, and M.H. Wheeler, Global bifurcation of solitary waves for the Whitham equation, *Math. Ann.* 383:1521, 2021 (45 pages).
14. R.M. Chen, S. Walsh, and M.H. Wheeler, Global bifurcation of anti-plane shear fronts, *J. Nonlinear Sci.* 31:28, 2021 (31 pages).
15. V.S. Krishnamurthy, M.H. Wheeler, D.G. Crowdy, and A. Constantin, A transformation between stationary point vortex equilibria, *Proc. R. Soc. A.* 476:20200310, 2020 (21 pages).
16. A. Constantin, D.G. Crowdy, V.S. Krishnamurthy, and M.H. Wheeler, Stuart-type polar vortices on a rotating sphere, *Discrete Contin. Dyn. Syst.* 41(1): 201, 2021 (15 pages).
17. V.M. Hur and M.H. Wheeler, Exact free surfaces in constant vorticity flows, *J. Fluid Mech. (Rapids)* 896:R1, 2020 (10 pages).
18. V. Kozlov, E. Lokharu, and M.H. Wheeler, Nonexistence of subcritical solitary waves, *Arch. Rational Mech. Anal.*, 241:525, 2021 (18 pages).
19. R.M. Chen, S. Walsh, and M.H. Wheeler, Center manifolds without a phase space for quasilinear problems in elasticity, biology, and hydrodynamics, *Nonlinearity* 35(4):1927, 2022 (59 pages).
20. Z. Hassainia, N. Masmoudi, and M.H. Wheeler, Global bifurcation of rotating vortex patches, *Comm. Pure Appl. Math.* 73(9):1933, 2020 (36 pages).
21. V.S. Krishnamurthy, M.H. Wheeler, D.G. Crowdy, and A. Constantin, Steady point vortex pair in a field of Stuart-type vorticity, *J. Fluid Mech. (Rapids)* 874:R1, 2019 (11 pages).
22. M.H. Wheeler, On stratified water waves with critical layers and Coriolis forces, *Discrete Contin. Dyn. Syst.* 39(8):4747, 2019 (24 pages).
23. R.M. Chen, S. Walsh, and M.H. Wheeler, Existence, nonexistence, and asymptotics of deep water solitary waves with localized vorticity, *Arch. Rational Mech. Anal.* 234(2):595, 2019 (39 pages).
24. M.H. Wheeler, Simplified Models for Equatorial Waves with Vertical Structure, *Oceanography* 31(3):36, 2018 (6 pages)
25. M.H. Wheeler, Integral and asymptotic properties of solitary waves in deep water, *Comm. Pure Appl. Math.,* 71:1941, 2018 (16 pages).
26. R.M. Chen, S. Walsh, and M.H. Wheeler, Existence and qualitative theory for stratified solitary water waves, *Ann. Inst. H. Poincaré Anal. Non Linéaire* 35(2):517, 2018 (60 pages).
27. R.M. Chen, S. Walsh, and M.H. Wheeler, On the existence and qualitative theory for stratified solitary water waves, *C. R. Math. Acad. Sci. Paris* 354(6):601, 2016 (5 pages).
28. W.A. Strauss and M.H. Wheeler, Bound on the slope of steady water waves with favorable vorticity, *Arch. Rational Mech. Anal.* 222:1555, 2016 (26 pages).
29. M.H. Wheeler, The Froude number for solitary water waves with vorticity, *J. Fluid Mech.* 768:99, 2015 (22 pages).

30. M.H. Wheeler, Solitary water waves of large amplitude generated by surface pressure, *Arch. Rational Mech. Anal.* 218(2):1131, 2015 (57 pages).
31. M.H. Wheeler, Large-amplitude solitary water waves with vorticity, *SIAM J. Math. Anal.*, 45(5):2937, 2013 (58 pages).
32. S. Constantin, R.S. Strichartz, M.H. Wheeler, Analysis of the Laplacian and spectral operators on the Vicsek set, *Commun. Pure Appl. Anal.*, 10(1):1, 2011 (44 pages).

## Invited talks

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|---|---|
| 2024 Jun | SIAM Conference on Nonlinear Waves and Coherent Structures, Minisymposium on "Steady Water Waves" |
| 2024 May | Durham Analysis and PDE seminar |
| 2023 Nov. | Cardiff Analysis seminar |
| 2023 Sep. | ICMAT conference "Young Researchers in PDEs" |
| 2023 Sep. | Bath workshop on "Singularities and Patterns in Evolution Equations" |
| 2023 Aug. | Lund Analysis seminar |
| 2023 May | Surrey Dynamical Systems and PDEs seminar |
| 2023 May | ICMS workshop on "Waves and Free Surface Flows: the Next Twenty Years" |
| 2023 Apr. | NTNU Differential Equations and Numerical Analysis Seminar |
| 2023 Apr. | British Applied Mathematics Colloquium, minisymposium on "Advances in water waves and free surface flows" |
| 2022 Sep. | University of Stuttgart Workshop on spatial dynamics and related approaches |
| 2022 Jun. | University of Pittsburgh workshop on Nonlinear Waves in Discrete and Continuum Systems |
| 2022 May | One World PDE seminar |
| 2022 Feb. | Karlsruhe Conference on Mathematics of Wave Phenomena, Minisymposium on "Water waves and dispersive equations" |
| 2022 Feb. | University of Bath Asymptotics, Operators, and Functionals seminar |
| 2021 Dec. | University College London Applied Mathematics Seminar |
| 2021 Sep. | UC Davis PDE and Applied Math Seminar |
| 2021 Jun. | UK–China Workshop on Emerging Issues in Applied and Geometric PDEs |
| 2021 Jun. | Online Seminar Series on Up-and-coming Results in PDEs (Gran Sasso Science Institute) |
| 2021 Mar. | University of Missouri Differential Equations Seminar |
| 2021 Mar. | University of Pittsburgh PDE and Analysis Seminar |
| 2021 Feb. | University of Arizona Analysis, Dynamics, and Applications seminar |
| 2020 Oct. | Online North East PDE and Analysis Seminar series on "Steady water waves" |
| 2020 Oct. | Waves in One World Seminar |
| 2019 Nov. | LMA (Poitiers) PDE Seminar |
| 2019 Nov. | Loughborough Applied Mathematics Seminar |
| 2019 Oct. | Bath Analysis Seminar |
| 2019 Oct. | Leiden University Lunchtime Analysis Seminar |
| 2019 Sep. | NTNU Differential Equations and Numerical Analysis Seminar |
| 2019 Jul. | Oberwolfach meeting on "Mathematical Theory of Water Waves" |
| 2019 May | Saarland University Math Colloquium |
| 2019 Apr. | University of Missouri Differential Equations Seminar |
| 2019 Apr. | IMACS Conference on Nonlinear Evolution Equations and Wave Phenomena, Special Session on "Stability and traveling waves" |
| 2019 Mar. | Seminar at NYU Abu Dhabi |
| 2019 Feb. | Lund University PDE Seminar |
| 2019 Feb. | University of Bath |
| 2018 Dec. | Seminar at EPFL |

2018 Sep. Dynamics Days Europe, Minisymposium on “Interfacial waves”
2018 Jul. Karlsruhe Conference on Mathematics of Wave Phenomena, Minisymposium on “Mathematical theory of water waves”
2018 Jun. Lund Workshop on Fluid Dynamics and Dispersive Equations
2018 May Drexel Waves Workshop
2018 Feb. University of Bath Applied Math Seminar
2017 Apr. ICERM Workshop on “Water Waves”
2017 Mar. IMACS Conference on Nonlinear Evolution Equations and Wave Phenomena, Special Session on “Traveling waves and spectral theory”
2017 Feb. University of Oklahoma Mathematics Colloquium
2017 Jan. University of Texas at Dallas Mathematics Colloquium
2016 Nov. Banff International Research Station, Workshop on “Theoretical and Computational Aspects of Nonlinear Surface Waves”
2016 Oct. AMS Fall Sectional Meeting, Special Session on “Multi-scale phenomena in linear and nonlinear PDE”
2016 Aug. XIIIème Colloque Franco-Roumain de Mathématique Appliquées, Special Session on “Problèmes à frontière libre”
2016 Jul. 11th AIMS International Conference, Session on “Dispersive effects in Nonlinear PDEs”
2016 Jul. 11th AIMS International Conference, Special Session on “PDEs from Fluid Mechanics”
2016 Jun. Boston University Conference on “Analysis of PDEs using Dynamical Systems Techniques”
2016 May Princeton Analysis of Fluids and Related Topics Seminar
2016 Jan. AMS Joint Math Meetings, Special Session on “Water Waves”
2015 Nov. University of Missouri Differential Equations Seminar
2015 Oct. Brown University PDE Seminar
2015 Apr. Oberwolfach meeting on “Mathematical Theory of Water Waves”
2015 Mar. University of Pittsburgh workshop on “PDEs and Free Boundary problems”
2015 Feb. Drexel University PDE/Applied Math Seminar
2014 Oct. University of Pittsburgh PDE and Analysis Seminar
2014 Sep. Courant Institute Analysis Seminar
2014 Jul. Newton Institute program on “Theory of Water Waves”
2014 May Courant Institute Analysis Seminar
2014 May University of Washington / Seattle University Mathematical Methods Seminar
2014 Apr. Boston University Dynamical Systems Seminar
2014 Mar. IMPA Thematic Program on Incompressible Fluid Dynamics, School “Around Vortices”
2013 Dec. SIAM Conference on Analysis of PDEs, Minisymposium on “Water Waves”
2013 Nov. King’s College London Analysis Seminar
2013 Oct. Cornell University Analysis Seminar
2013 Aug. Stanford Summer School and Workshop “Recent Advances in PDEs and Fluids”
2013 May SIAM Conference on Applications of Dynamical Systems, Minisymposium on “Nonlinear Surface Water Waves”
2013 May Brown University PDE Workshop on “Mathematical Study Related to Fluid Mechanics”
2013 Feb. Georgia Tech PDE Seminar
2012 Jun. SIAM Conference on Nonlinear Waves and Coherent Structures, Minisymposium on “Water Wave Bifurcations: Theory and Numerics”
2012 Mar. Brown University PDE Seminar
2008 Oct. AMS Eastern Sectional Meeting, Special Session on “Analysis on Metric Measure Spaces and on Fractals”

## PhD students

Jonty Sewell: 2022–present (with Karsten Matthies and Alex Doak)

Daniel Abraham: 2023–present

## Visiting appointments

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| November 3–16, 2019 | MFO Research in Pairs |
| May 20 – June 20, 2019 | ESI Research in Teams |
| Spring 2017 | ICERM Semester Program on Singularities and Waves in Incompressible Fluids |

## Awards

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| 2014 – 2017 | NSF Mathematical Sciences Postdoctoral Research Fellowship DMS 1400926 ($150,000) |
| 2015 | Oberwolfach Leibniz Graduate Students travel grant |
| 2013 | SIAM Student Travel Award |
| 2013 | Graduate Student Teaching Award, Brown University |
| 2009 | Kieval Prize in Physics, Cornell University |

## Service

- Reviewer for: *Ann. Inst. H. Poincaré C Anal. Non Linéaire*; *Arch. Rational Mech. Anal.* (6); *Comm. Math. Phys.*; *Discrete Contin. Dyn. Syst.* (2); *Duke Math. J.*; *J. Amer. Math. Soc.* (2); *J. Differential Equations*; *J. Fluid Mech.* (3); *J. Funct. Anal.*; *J. Math. Fluid Mech.*; *J. Nonlinear Sci.* (2); *Nonlinearity* (2); *Math. Ann.*; *Quart. J. Mech. Appl. Math.*; *SIAM J. Math. Anal.* (5); *Stud. Appl. Math.* (2) ; *Water Waves*
- Reviewer for Alexander von Humboldt Foundation fellowship, 2022
- Co-organizer of British Applied Mathematics Colloquium minisymposium on “Advances in water waves and free surface flows”, April 2023
- Co-organizer of an LMS-Bath Symposium on New Directions in Water Waves, July 2022
- Co-organizer of the University of Bath Analysis and Differential Equations Seminar, August 2021 – present
- Co-founder and co-organizer of the One World PDE Seminar, March 2020 – March 2021
- Organizer of Brown Informal PDE Seminar, Spring 2012 – Spring 2013

## Teaching

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|---|---|---|---|
| University of Bath | 2020–2024 | Spring | Theory of Partial Differential Equations |
| | 2020–2023 | Fall | Advanced Real Analysis |
| | 2022 | Spring | Generalised Solitary Waves in 4th ODEs |
| University of Vienna | 2018 | Winter | Topics in Analysis: Fluid Mechanics |
| | 2018–2019 | Summer | Tutorial on ODEs |
| | 2017 | Winter | Tutorial on PDEs |
| New York University | 2016 | Fall | Analysis |
| | 2015 | Spring | Calculus I |
| | 2014 | Fall | Calculus II |
| Brown University | 2012 | Fall | Multivariable Calculus (Physics/Engineering) |
| | 2012 | Spring | Multivariable Calculus (Physics/Engineering) |
| | 2011 | Spring | Introductory Calculus II (Teaching Assistant) |
| | 2010 | Fall | Introductory Calculus II (Teaching Assistant) |
| | 2011 | Fall | Math Resource Center (dept.-run drop-in tutoring) |

## Awards for teaching and expository writing

- Mary Tasker Award for excellence in teaching

"Highly Commended" by Awards Committee (2023–2024)
Nominated (2022–2023)

- Halmos–Ford Award from the MAA (2022)
- Bath University Mathematics Society award for "Best lecturer of a pure module" (2020–2021)
- Advance HE Fellowship (FHEA) (2021)
- Brown University Sheridan Center for Teaching and Learning Certificate I (2011–2012)

## Undergraduate supervision

| | | |
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| 2023–2024 | Joel Baldwin | MMath project on "Asymptotic methods for rotating vortex patches" |
| Spring 2022 | Huy Vo | BSc project on "Nonlinear functional analysis" |
| 2022–2023 | Louis Carpenter | MMath project on "Sobolev Spaces and Nonlinear Elliptic PDEs" |
| Spring 2021 | Ciaran Barnes | BSc project on "Surface waves: dispersion and particle paths" |
| 2021–2022 | Matthew Holmes | MMath project on "Bifurcation theory" |

## Expository talks

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| 2024 Jun. | University of Pittsburgh mini-lectures on "Bifurcation Theory" |
| 2024 May | Bath Connections lecture, "Fractals and fixed points" |
| 2019 May | Vienna Master Class Mathematical Physics, "Local and global bifurcation in fluid mechanics" |
| 2016 Apr. | cSplash, with Anand Oza (for high school students), "It's a wavy world: wind, water, and quantum mechanics" |
| 2015 Oct. | Simon's Rock Math Talk (for undergraduates), "Fun with game theory" |
| 2015 Feb. | Courant Institute Graduate Student / Postdoc Seminar, "Steady water waves" |
| 2013 Mar. | Brown Graduate Student Seminar, "The one-dimensional maximum principle" |
| 2013 Apr. | Brown Graduate Student Seminar, "Convex functions and the Legendre–Fenchel transform" |
| 2011 Dec. | Brown Graduate Student Seminar, "Bending rulers and bifurcation from a simple eigenvalue" |
| 2010 Feb. | Brown Graduate Student Seminar, "Calculus on fractals" |

## Other conferences and workshops attended

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| 2023 Sep. | IML program on "Order and Randomness in Partial Differential Equations" |
| 2018 Aug. | Prague Sum Summer School and Workshop |
| 2017 Mar. | ESI Mathematical Aspects of Physical Oceanography |
| 2017 Dec. | ESI Nonlinear Water Waves – an Interdisciplinary Interface |
| 2011 Fall | ICERM Semester Program on Kinetic Theory and Computation |
| 2010 May | SIAM/RSME–SCM–SEMA Meeting on Emerging Topics in Dynamical Systems and Partial Differential Equations |
| 2008 Jun. | 3rd Conference on Analysis and Probability on Fractals |