
ACADEMIC POSITIONS

EPSRC Doctoral Prize (Research Associate)

Oct. 2022 – Present

Department of Mathematical Sciences, University of Bath.

EDUCATION

Doctor of Philosophy in Mathematics

2018 – 2022

Department of Mathematical Sciences, University of Bath.

Supervisors: Dr. Philippe Trinh & Prof. Paul Milewski.

Thesis: *Exponential asymptotics of parasitic capillary ripples and the complication of divergent eigenvalues.***MSci in Mathematics (First class)**

2014 – 2018

Department of Mathematics, Imperial College London.

Supervisor: Prof. Demetrios Papageorgiou.

Thesis: *Artificial boundary conditions for computing Stokes flows around a bubble with a stagnant surfactant cap.*

RESEARCH INTERESTS

- Asymptotic analysis: Exponential asymptotic techniques for beyond-all-order phenomena in ODEs and PDEs; boundary layer theory and matched asymptotic expansions; multiple scales analysis.
- Fluid dynamics: Nonlinear free-surface waves; exponentially small effects of singularly perturbed limits (such as small surface tension, low-speed flows, small viscosity, and small vorticity in critical layer instabilities).
- Numerical methods: Boundary integral methods for ODEs, PDEs, and integral equations; numerical continuation for bifurcation structures.

AWARDS & PUBLICATIONS

Awards

- UK Fluids Network 2023 Thesis Prize (winner).
Awarded for the best fluid mechanics thesis examined in the UK during 2022.
- IMA Lighthill-Thwaites Prize (finalist) at the British Applied Mathematics Conference, April 2023.

Publications

- (4) Shelton, J., Milewski, P. & Trinh, P. H., (2023). On the structure of parasitic gravity-capillary standing waves in the small surface tension limit. *J. Fluid Mech.*, 972.
- (3) Shelton, J. & Trinh, P. H., (2023) Exponential asymptotics and the generation of free-surface flows by submerged line vortices. *J. Fluid Mech.*, 958.
- (2) Shelton, J. & Trinh, P. H., (2022). Exponential asymptotics for steady parasitic capillary ripples on steep gravity waves. *J. Fluid Mech.*, 939.
- (1) Shelton, J., Milewski, P. & Trinh, P. H., (2021). On the structure of steady parasitic gravity-capillary waves in the small surface tension limit. *J. Fluid Mech.*, 922.

Submitted

- Pathological exponential asymptotics for a model problem of an equatorially trapped Rossby wave. (with S. J. Chapman and P. Trinh). <https://arxiv.org/pdf/2302.05085.pdf>
- Exponential asymptotics and higher-order Stokes phenomenon in singularly perturbed ODEs (with S. Crew and P. Trinh). <https://arxiv.org/pdf/2303.07866.pdf>
- A model ODE for the exponential asymptotics of nonlinear parasitic capillary ripples (with P. Trinh). <https://arxiv.org/pdf/2309.11779.pdf>
- A time-dependent formulation for nonlinear gravity-capillary surface waves with viscosity. (with P. Trinh and P. Milewski). <https://arxiv.org/pdf/2403.06620.pdf>
- An enthalpy-based model for the physics of ice crystal icing. (with T. Peters, P. Trinh, and H. Tang)

In preparation

- On the exponentially-small instability of the equatorial Kelvin wave in shear. (with S. Griffiths, S. J. Chapman, and P. Trinh).
- Capillary effects in vorticity driven surface waves. (with P. Trinh)

LECTURING, TUTORING, & SUPERVISION

Lecturing

2022-23 Semester 2 36 lectures for the second year course *vector calculus and partial differential equations* (MA20223).

Tutoring

In previous years, I have ran first year undergraduate computer labs in Matlab (XX10190) and Python (MA10276), and tutorials in vector calculus and mechanics (MA10236) and vector calculus and partial differential equations (MA20223). I have also developed exercises for an Issac Newton Institute workshop on *Exponential asymptotics for physical applications*.

Supervision

- Co-supervision of a third-year PhD student from the Bath SAMBa CDT. This project involves the development of mathematical models to study the internal ice accretion of aeroplane engines at high-altitude.
- Supervision of an undergraduate MMath project (2023-24) on singularly perturbed boundary-value problems with exponentially-small effects.

RESEARCH TALKS

- 2023 Oct. Imperial fluid dynamics seminar.
Beyond-all-order asymptotics in the equatorial Kelvin wave and free-surface water waves.
- 2023 Sep. Okinawa Institute of Science and Technology (OIST).
Beyond-all-order effects in surface water waves.
- 2023 April. British Applied Mathematics Colloquium (BAMC), Bristol.
Exponential asymptotics for steady capillary ripples on steep gravity waves.
- 2022 Nov. Applicable resurgent asymptotics workshop, Isaac Newton Institute.
Exponential asymptotics for the equatorial Kelvin wave and the higher-order Stokes phenomenon.
- 2022 July. New Directions in Water Waves workshop, University of Bath.
Temporally periodic water waves with small surface tension.
- 2022 May. Bath-Bristol Centre for Nonlinear Mechanics meeting, University of Bath.
On the structure of parasitic gravity-capillary waves in the small surface tension limit.
- 2021 Dec. Fluid mechanics seminar, University of Nottingham.
Exponential asymptotics for steady parasitic gravity-capillary waves.
- 2021 April. British Applied Mathematics Colloquium (BAMC), University of Glasgow.
On the structure of parasitic gravity-capillary waves in the small surface tension limit.
- 2020 Dec. Applied and Interdisciplinary Mathematics Seminar (AIMS), University of Bath.
Parasitic gravity-capillary waves in the small surface tension limit.
- 2019 Oct. Nonlinear Waves and Interfacial Dynamics UK Fluids Network SIG, Imperial College London.
Parasitic gravity-capillary waves in the small surface tension limit.