Jordan McCarney

Curriculum Vitae

School of Mathematical Sciences,
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Education

2022—2026 **Ph.D. in Mathematics**
"Mathematical Aspects of Internal Wave-Current Interactions"
University College Cork (UCC), Advisor: Dr. David Henry.

2018—2022 **B.Sc. in Theoretical Physics**
"Roulettes and Pedal Curves: Generation of Road-Wheel Pairs"
National University of Ireland, Galway [now University of Galway (UG)].

Research Interests

My research interests concern the nonlinear analysis of ordinary and partial differential equations, particularly those that arise in the context of geophysical fluid flows in the ocean and atmosphere. Much of my work addresses free-boundary problems. In general though, my interests lie in the use of rigorous mathematics to answer questions which arise in applications.

Publications

As part of my PhD, I have published both independently and with collaborators in international research journals. My research so far has been primarily focused on internal wave-current interactions in both the ocean and atmosphere.

2026

[1] D. Devine and **J.McCarney**. Flow underlying coupled surface and internal waves with rotational lower layer. *In preparation.*

[2] T.Lyons and **J.McCarney**. Nonlinear temperature dependent enthalpies in exact nonlinear mountain waves, *Differential and Integral Equations, in press.*

2025

[3] T.Lyons and **J.McCarney**. Temperature dependent precipitation in exact nonlinear mountain waves, *Journal of Mathematical Fluid Mechanics*, 27(3)

2024

[4] **J.McCarney.** Nonhydrostatic internal waves in the presence of mean currents and rotation, *Journal of Mathematical Physics*, 65(4)

2023

[5] **J.McCarney.** Exact internal waves in the presence of mean currents and rotation, *Journal of Mathematical Physics*, 64(7)

Awards and Prizes

2024 **Postgraduate Publication of the Year**
UCC College of Science, Engineering and Food Science.

I received this award for my independent research article [4], which highlights exceptional peer-reviewed research, and reflects that my work has been recognized by the academic community for its quality and significance.

Invited Research Presentations

One of the most enjoyable aspects of my Ph.D. studies has been the opportunity to disseminate my research both domestically within Ireland, and internationally. These have been excellent opportunities to meet and engage with other researchers and to develop a connection with the wider academic community.

2026

26-28 Aug **Wave-NED Conference on Mathematics of Wave Phenomena**
Delft University of Technology, Delft, The Netherlands. (Oral Presentation)
Mini Symposium: Internal Waves in the Ocean and Atmosphere

26-29 May **SIAM Conference on Nonlinear Waves and Coherent Structures**
Concordia University, Montréal, Québec, Canada. (Oral Presentation)
Contributed Presentation: Atmospheric and Mountain Wave Theory.

11 Feb **Mathematics and Statistics Seminar**
Technological University Dublin, Ireland. (Oral presentation)

2025

18 Nov **Oberseminar Analysis und Theoretische Physik**
Leibniz Universität Hannover, Germany. (Oral presentation)

16-19 Jun **"Modelling of fluid propagation: mathematical theory and numerical approximation"** International Centre for Mathematical meetings,
Castro Urdiales, Spain. (Oral presentation)

2 Apr **Mathematics and Physics Seminar**
South East Technological University, Waterford, Ireland. (Oral presentation)

26 Mar **PDE Seminar**
University College Cork, Ireland. (Oral presentation)

2024

28-30 Aug **"Water Waves-Mathematical Theory and Applications"**
University of Plymouth, UK. (Poster and short presentation)

27-31 May **EWM-EMS Summer School: "Water Waves and Nonlinear Dispersive Equations"**
Mittag-Leffler Institute, Stockholm, Sweden. (Poster and short presentation)

Invited Visits to Research Institutes

Over the course of my Ph.D. I have been invited to attend highly prestigious, international research institutes. Through these visits I have benefited from courses delivered by world-leading experts in the mathematical analysis and modelling of fluid flows.

2025

16-19 Jun **International Centre for Mathematical Meetings**, Castro Urdiales, Spain.
"Modelling of fluid propagation: mathematical theory and numerical approximation".

2024

27-31 May **Mittag-Leffler Institute**, Djursholm, Sweden.
EWM-EMS Summer School: "Water Waves and Nonlinear Dispersive Equations".

2023

22-25 May **Erwin Schrödinger Institute**, Vienna, Austria.
"The Dynamics of Planetary-scale Fluid Flows".

Supervision

This academic year, I have taken on the role of supervising a final year undergraduate student project. The project is directly linked to my own research and has been an incredibly enriching experience. It has proved an excellent opportunity to strengthen my foundational knowledge of the subject, and to develop critical communication skills in order to aid the student learn as effectively as possible.

2025/26

B.Sc. Mathematical Sciences Thesis
Ms. Megan Flynn, "Topological degree theory and its applications".

Teaching

I value having an active role in the academic community, and teaching is an important and highly rewarding aspect of this. I have experience delivering advanced undergraduate mathematics lectures, particularly in partial differential equations and fluid mechanics. I also have experience leading practical, problem-solving sessions through roles as a tutor.

Teaching Assistant - UCC
AM4063 Partial Differential Equations with Applications II
AM3063 Partial Differential Equations with Applications I
AM3052 Introduction to Fluid Mechanics and Wave Theories
AM2071 Transform and Variational Methods

Tutor - UCC
AM2071 Transform and Variational Methods
AM2061 Computer Modelling and Numerical Techniques
AM1052 Introduction to Mechanics

Tutor - UG
Physics Undergraduate Problem Solving - Provided one-on-one and small-group tutorial problem-solving sessions for 1st year physics students.

Pedagogical Development - UCC
I successfully completed "PG6003 Teaching and Learning for Graduate Studies", which developed my ability to design, deliver, and critically evaluate inclusive learning experiences by drawing on educational research and evidence to continuously improve student experiences.

Referee Activity

I have been invited to act as a referee for the following international research journals:

- *Journal of Mathematical Physics,*
- *Nonlinear Analysis: Real World Applications*,
- *Qualitative Theory of Dynamical Systems.*

References

Dr. David Henry (Ph.D. Supervisor)
Senior lecturer, Mathematical Sciences, University College Cork, Ireland.
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Prof. Dr. Joachim Escher
Chair in Applied Analysis, Leibniz Universität Hannover, Germany.
escher@ifam.uni-hannover.de

Prof. Dr. Adrian Constantin
Chair in Partial Differential Equations, University of Vienna, Austria.
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