

School of Mathematics
University of Edinburgh
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Academic employment

Flora Philip Research Fellow , University of Edinburgh (on leave in 2023–2024)	2023–2028
JSPS Postdoctoral Research Fellow , Osaka University	2023–2024
Maxwell Institute Postdoctoral Research Fellow , University of Edinburgh	2022–2023

Education

PhD in Mathematics , University of Edinburgh	2018–2022
MASt in Pure Mathematics , University of Cambridge	2017–2018
BSc (Hons.) in Mathematics , King’s College London	2015–2017
Modules in Mathematics (120 credits at SCQF levels 7–9), Open University	2012–2015
MA (Hons.) in Scottish Ethnology , University of Edinburgh	2005–2009

Publications and preprints

Hepworth and Roff. Bigraded path homology and the magnitude-path spectral sequence. arXiv:2404.06689, 2024	
Roff and Yoshinaga. The small-scale limit of magnitude and the one-point property. arXiv:2312.14497, 2023	
Hepworth and Roff. The reachability homology of a directed graph. arXiv:2312.01378, 2023	
Roff. Iterated magnitude homology. arXiv:2309.00577, 2023	
Roff. Magnitude, homology, and the Whitney twist. <i>Homol. Homotopy Appl.</i> 26(1):105–130, 2024	
Roff. <i>The size and shape of things: Magnitude, diversity, homology</i> . PhD thesis, Edinburgh, 2022	
Leinster and Roff. The maximum entropy of a metric space. <i>Q. J. Math.</i> 72(4):1271–1309, 2021	

Research visits

Beijing Institute for Mathematical Sciences and Applications (BIMSA) (1 week)	April 2024
Department of Mathematics, Fukuoka University (1 week)	February 2024
Mathematical Institute, University of Oxford (1 week)	May 2023

Invited talks

‘Bigraded path homology and the magnitude-path spectral sequence’. <i>Special Session on Discrete and Combinatorial Homotopy, AMS–UMI Joint Meeting, Palermo</i>	2024
‘Entropy, diversity and magnitude: a survey, with questions’. <i>Dynamical Systems Seminar, Kyoto</i>	2024
‘Bigraded path homology and the magnitude-path spectral sequence’. <i>Topology Seminar, BIMSA</i>	2024
‘What is the shape of a network?’ <i>SIAM Minisymposium on Magnitude, TU Eindhoven</i>	2023
(Two untitled talks.) <i>Beyond Finite Sets: Homotopy Theory and Combinatorics Workshop, Copenhagen</i>	2023
‘Magnitude homology of enriched groups’. <i>Topology Seminar, Aberdeen</i>	2023
‘What are higher-order roles in social systems?’. <i>10th Symposium on Compositional Structures (SYCO10), Edinburgh</i>	2022
‘Magnitude homology, normed groups and holes in the plane’. <i>Algebra, Geometry & Combinatorics Colloquium, TU Dresden</i>	2022
‘Magnitude homology and iterated enrichment’. <i>PostGrad Forum, Lancaster</i>	2021
‘Magnitude homology of semidirect products and spheres’. <i>Bicategories Seminar, Sheffield</i>	2021

‘Maximum entropy, uniform measure’. ML@CL Machine Learning Seminar, Cambridge	2020
‘Magnitude homology, from scratch’. Pure PostGrad Seminar, Southampton	2020
‘Diversity and magnitude’. LMS Applied Algebra and Geometry Research Network, Oxford	2019
‘The magnitude and diversity of a metric space’. TopApp Workshop, IST Austria	2019

Contributed talks

‘Iterated magnitude homology’. Magnitude 2023, Osaka	2023
‘Magnitude homology in Euclidean space’. PSSL 106, Brno	2022
‘Magnitude homology and iterated enrichment’. CT20→21, Genova	2021
‘Magnitude homology and iterated enrichment’. Categories & Companions, Macquarie	2021
‘The maximum diversity of a compact space’. Magnitude 2019, ICMS, Edinburgh	2019

Local seminar talks

‘Reachability homology and the magnitude-path spectral sequence’. Topology Seminar, Osaka	2023
‘Magnitude, diversity, homology: a survey, with questions’. Analysis Seminar, Edinburgh	2023
‘Return of the alley cats’. The Categorical Late Lunch, Edinburgh	2021
‘What is a hole in a locally metric category?’. The Categorical Late Lunch, Edinburgh	2021
‘Hochschild homology for enriched categories’. Hodge Club, Edinburgh	2019
‘The magnitude of an enriched category’. GEARS Seminar, Edinburgh	2019
‘Diversity: developments in the biology of mathematics’. Hodge Club, Edinburgh	2019
‘Building complexes from point clouds’. Persistent Homology Working Seminar, Edinburgh	2019
‘Commutative monads’. Part III Seminar, Cambridge	2018

Supervision and mentorship

Project supervisor in the School of Mathematics, University of Edinburgh

- ‘Quantifying political diversity’ 2022–2023
A year-long collaborative research project for a group of four final-year undergraduates, exploring applications of biodiversity measures in political science.
- ‘Categorified linear algebra and the Legendre–Fenchel transform’ 2020
A six-week summer research project for a third-year undergraduate, based on a paper by Simon Willerton.

Teaching mentor for the EdTA programme, University of Edinburgh

Advised mathematics PhD students preparing for Associate Fellowship of the HEA. 2020–2022

Other teaching

Nominee in Edinburgh’s student-led Teaching Awards

- As Teacher of the Year 2023
- As Student Tutor of the Year 2022

Lecturer in the School of Mathematics, University of Edinburgh

- Honours Algebra 2023
Part of the three-person teaching team for this core course taken by Year 3 mathematics students.
- Introduction to Linear Algebra 2022
Part of the four-person teaching team for this course taken by 800 Year 1 mathematics, computer science, natural science and engineering students.

Graduate teaching assistant in the School of Economics, University of Edinburgh

Created three video lectures for Advanced Mathematical Economics (Year 4 & MSc) 2021
Tutor for Advanced Mathematical Economics (Year 4 & MSc) 2019, 2020, 2021

Graduate teaching assistant in the School of Mathematics, University of Edinburgh

Tutor and marker for Honours Analysis Skills (Years 3–4) 2019, 2021
Tutor and marker for Honours Algebra (Years 3–4) 2019, 2020
Tutor and marker for Accelerated Proofs and Problem Solving (Year 2) 2019, 2020

Academic service

- Programme committee member for the **International Conference on Applied Category Theory**.
- **ACT2024**, University of Oxford 2024
 - **ACT2023**, University of Maryland 2023
 - **ACT2022**, University of Strathclyde 2022
- Co-organizer of **Magnitude 2023**, Osaka University 2023
- A week-long, 40-person workshop on magnitude and magnitude homology, supported by JSPS.
- Co-organizer of **The Categorical Late Lunch**, Edinburgh 2020–2023
- A fortnightly category theory seminar with a mixed crowd of mathematicians and computer scientists.
- Assistant (one of three) at the **AMS MRC on Applied Category Theory** 2022
- A collaborative research programme coordinated by the American Mathematical Society.
- Initiator and local organizer of **Topics in Category Theory: A Spring School**, ICMS, Edinburgh 2020
- A graduate conference involving 75 junior researchers in category theory and neighbouring disciplines, with participants travelling from Brazil, Japan, the USA, across Europe and the UK.
- Local helper at **CT2019**, ICMS, Edinburgh 2019
- The annual International Conference on Category Theory.

Equality, diversity and inclusion

- Colloquium speaker** for the Count Me In research experience programme, Edinburgh 2024
- Moderator of ED&I panel** at the first CATNIP meeting, Edinburgh 2023
- A discussion of ways to encourage more women to apply for PhDs in pure mathematics and computer science.
- Postdoc representative** on the ED&I Committee, School of Mathematics, Edinburgh 2022–2023

Grants obtained

- Scottish Mathematical Sciences Training Centre**, Knowledge Exchange Grant (£2,401) 2021
- London Mathematical Society**, Postgraduate Research Conference Grant (£2,551) 2019
- Glasgow Mathematical Journal Trust**, Learning and Research Support Fund (£3,489) 2019
- Edinburgh Mathematical Society**, Research Support Fund (£1,390) 2019

Interdisciplinary and public engagement

- Invited participant** at the Institute of Physical Sociality
- An interdisciplinary research group interested in mathematics and physics, ethics, gender and race, initiated by Edinburgh-based arts company Arika. For a body of work related to this project, Arika received one of ten Turner Bursaries awarded in 2020 in place of the Turner Prize.
- Online working group led by Denise Ferreira da Silva and Susanne Winterling 2021–2022
 - Week-long meeting at Skowhegan Gallery and New York University 2018
led by Karen Barad, Gabriel Catren, Fred Moten and Fernando Zalamea
- Instructor** for the LIFE project, Performing Arts Forum, France
- A series of week-long workshops introducing central themes of modern mathematics and physics to adults without a university education in science. Led by Gabriel Catren (Université Paris–Diderot) and supported by the Laboratoire SPHere—Sciences, Philosophie, Histoire.
- *Deeply Organized Chaos*, introducing non-linear dynamics and chaos theory. 2022
I gave a class on difference and differential equations and a workshop exploring fractal dimension.
 - *Mobilis in Mobili*, introducing the history of the relationship between physics and geometry. 2019
I gave a class on Euclidean and Cartesian geometry, and a workshop in which participants were guided collaboratively to invent Gaussian curvature and discover the *Theorema Egregium*.

- *Categories for the Hard-Working Non-Mathematician*, introducing key concepts of category theory. 2018
I gave three classes: on sets, equivalence relations and groupoids; on categories and functors; and on algebraic methods in topology.

Project leader for Difficult Conversations 2021
A knowledge exchange project hosted by DeMoS (Paris) and Arika (Edinburgh), and funded by the SMSTC.

Seminar guest at Robert Schumann Hochschule, Düsseldorf
Two seminar series, led by Julian Rohrhuber, for masters students of Music Informatics and Media Theory with an interest in abstract algebra and category theory. At each seminar I led two three-hour discussions around universal properties, diagrams and limits.

- *Leap and Limit* seminar 2019
- *Form and Formalism* seminar 2018

Academic scholarships

EPSRC Research Studentship, University of Edinburgh 2018–2022
Women in Science Scholarship, King’s College London 2015–2016

Memberships and accreditations

Member of the American Mathematical Society Since 2022
Associate Fellow of the HEA (Higher Education Academy/Advance HE) Since 2020
Member of the Isaac Newton Institute Since 2019
Member of the Edinburgh Mathematical Society Since 2018
Member of the London Mathematical Society Since 2017

Other professional experience

Welfare rights adviser, Glasgow and London 2011–2016
At Child Poverty Action Group (2015–’16), Drumchapel Money Advice Centre (’13–’15), WestGAP (’11–’13).
Arts producer, Edinburgh and Glasgow 2006–2012
At Arika (2012–’13) and Tracer Trails (’06–’12).