Denis Patterson

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Personal Website

Research Interests

Applied Analysis • Integral and integro-differential equations • Stochastic processes and applications

Application Areas • Ecology • Neuroscience • Morphogenesis/development

Academic Career

July 2018–Present — **Postdoctoral Fellow**, Brandeis University, Department of Mathematics
Mentor: Prof. Jonathan D. Touboul

May 2017–May 2018 — **Assistant Professor & Maths Learning Centre Director**
Dublin City University, School of Mathematical Sciences

Oct. 2013–Apr. 2018 — **PhD in Applied Mathematics**, Dublin City University
Thesis Title: *Asymptotic Growth in Nonlinear Stochastic and Deterministic Functional Differential Equations*
Advisor: Prof. John Appleby
Examiners: Prof. Sjoerd Verduyn Lunel (U. Utrecht), Prof. Eugene O'Riordan (DCU)

2009–2013 — **BSc in Actuarial Mathematics**, Dublin City University
First class honours – graduated first in class

Academic Honours & Awards

2017 — **Outstanding Graduate Researcher Award**, Dublin City University

2013–2017 — **Government of Ireland Postgraduate Scholarship**, Irish Research Council

2013 — **Student Actuary Prize**, Society of Actuaries in Ireland

2012 — **Hamilton Award for Mathematics**, Royal Irish Academy

Publications

Preprints/current projects

[P1] **D. D. Patterson**, S. A. Levin, A. C. Staver, J. D. Touboul, *Probabilistic foundations of the Staver-Levin model*, submitted.

[P2] **D. D. Patterson**, S. A. Levin, A. C. Staver, J. D. Touboul, *Dynamical mechanisms for the savanna-forest transition in a spatially extended Staver-Levin model*, in preparation.

[P3] **D. D. Patterson**, S.J. Chou, J. D. Touboul, *A mathematical model of neuronal identity with ectopic domains,* in preparation.

Peer Reviewed Journal Articles

[J7] J. A. D. Appleby and **D. D. Patterson**, *Blow–up and superexponential growth in superlinear Volterra equations*, Discrete Contin. Dyn. Syst. A, Vol. 38, No. 8 (2018), 3993–4017.

[J6] J. A. D. Appleby and **D. D. Patterson**, *Growth rates of sublinear functional and Volterra differential equations*, SIAM J. Math. Anal., Vol. 50, No. 2 (2018), 2086–2110.

[J5] J. A. D. Appleby and **D. D. Patterson**, *Memory dependent growth in sublinear Volterra differential equations*, J. Integral Equations Appl., Vol. 29, No. 4 (2017), 531–584.

[J4] J. A. D. Appleby and **D. D. Patterson**, *Large fluctuations and growth rates of linear Volterra summation equations*, J. Difference Equ. Appl., Vol. 23, No. 6 (2017), 1047–1080.

[J3] J. A. D. Appleby and **D. D. Patterson**, *Growth rates of solutions of superlinear ordinary differential equations*, Appl. Math. Lett., Vol. 71 (2017), 30–37.

[J2] J. A. D. Appleby and **D. D. Patterson**, *Hartman–Wintner growth results for sublinear functional differential equations*, Electron. J. Differential Equations, Vol. 2017, No. 21 (2017), 1–45.

[J1] J. A. D. Appleby and **D. D. Patterson**, *On the admissibility of unboundedness properties of forced deterministic and stochastic sublinear Volterra summation equations*, Electron. J. Qual. Theory Differ. Equ., No. 63 (2016), 1–44.

Conference Papers

[C3] J. A. D. Appleby and **D. D. Patterson**, *Classification of convergence rates of solutions of perturbed ordinary differential equations with regularly varying nonlinearity*, Electron. J. Qual. Theory Differ. Equ., Proc. 10th Coll. Qualitative Theory of Diff. Equ., No. 3 (2016), 1–38.

[C2] J. A. D. Appleby and **D. D. Patterson**, *Subexponential growth rates in functional differential equations*, Discrete and Continuous Dynamical Systems Supplement (2015), 56–65.

[C1] J. A. D. Appleby and **D. D. Patterson**, *On necessary and sufficient conditions for preserving convergence rates to equilibrium in deterministically and stochastically perturbed differential equations with regularly varying nonlinearity*, Recent Advances in Delay Differential and Difference Equations, Springer Proceedings in Mathematics & Statistics 94 (2014), 1–85.

Academic Talks

June 2020	*SIAM Mathematics of Planet Earth*, California, USA (forthcoming)
Mar. 2020	*AMS Eastern Sectional Meeting*, Tufts University, USA (forthcoming)
Oct. 2019	*ICMA VII*, Arizona State University, USA
Sep. 2019	*Dynamics Seminar*, Boston University, USA
May. 2019	*SIAM DS19*, Snowbird, Utah, USA
Apr. 2019	*Mathematics and Statistics Seminar*, University of Limerick, Ireland
July 2017	*Equadiff 2017*, Slovak University of Technology in Bratislava, Slovakia
May 2017	*SIAM UKIE Chapter Student Meeting*, NUI Galway, Ireland (Best Talk Prize)
Apr. 2017	*British Applied Mathematics Colloquium*, University of Surrey, UK
Mar. 2017	*Mathematics and Statistics Seminar*, University of Limerick, Ireland
July 2016	*11th AIMS Conference*, Orlando, Florida, USA
July 2015	*ICDEA 2015*, Białystok University of Technology, Poland
July 2015	*10QTDE*, Bolyai Institute, University of Szeged, Hungary
Dec. 2014	*SIAM Student Meeting*, NUI Galway, Ireland
July 2014	*10th AIMS Conference*, Universidad Autonoma de Madrid, Spain

Service & Affiliations

Reviewer for the Journal of Difference Equations and Applications, Electronic Journal of the Qualitative Theory of Differential Equations, and Mathematical Reviews;

Member of the International Society of Difference Equations (ISDE);

Member of the Society for Industrial and Applied Mathematics (SIAM);

Organised the Brandeis Mathematical Biology Seminar series 2018–2019;

Organised the DCU Mathematical Sciences Postgraduate Seminar series 2014–2017.

Teaching Experience

Fall 2019	**Lecturer**, Probability, Brandeis University
Spring 2019	**Lecturer**, Multivariate Calculus, Brandeis University
Winter 2017	**Lecturer**, Simulation for Finance (graduate course), Dublin City University Theory and simulation of stochastic processes with financial applications.
Spring 2016	**Lecturer/Tutor**, Algebra 2, University of Limerick

Undergraduate Research Projects supervised:

Summer 2019	Hanyu Song (Applied Math, Brandeis), "Mathematical Models of Somitogenesis"
Spring 2020	Hange Zhu (Applied Math, Brandeis), "Pattern Formation in Heterogeneous domains"

Programming/Software

C++, MATLAB/Scilab, Mathematica, XPP & Matcont, FreeFem++, R, Hive, SQL, GeoGebra, LaTeX