

DENIS PATTERSON



High Meadows Environmental Institute,
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Research Interests

Applied Analysis Integral/integro-differential equations, stochastic processes and applications, PDEs
Mathematical Biology Ecology (vegetation models), neuroscience/development (cell fate models)

Academic Career

Nov. 2020–present	Postdoctoral Research Associate , Princeton University High Meadows Environmental Institute Mentor: Prof. Simon A. Levin
July 2018–Oct. 2020	Postdoctoral Research Associate , Brandeis University Department of Mathematics Mentor: Prof. Jonathan D. Touboul
May 2017–May 2018	Assistant Professor , Dublin City University School of Mathematical Sciences
Oct. 2013–Apr. 2018	PhD in Applied Mathematics , Dublin City University Thesis: <i>Asymptotic Growth in Nonlinear Stochastic and Deterministic Functional Differential Equations</i> Advisor: Prof. John A. D. Appleby
2009–2013	BSc in Actuarial Mathematics , Dublin City University First class honours – graduated first in class

Publications

Preprints

- [P1] J. Feng*, W. H. Hsu*, C. S. Tseng, **D. D. Patterson**, Z. H. Zhuang, H. W. Hsin, Y.T. Huang, A. Faedo, J. L. Rubenstein, J. D. Touboul and S.J. Chou, *COUP-TFI specifies the medial entorhinal cortex identity and induces differential cell adhesion to determine the integrity of its boundary with neocortex*, submitted [*joint first author].

Peer Reviewed Journal Articles

- [J9] J. A. D. Appleby and **D. D. Patterson**, *Growth and fluctuation in perturbed nonlinear Volterra equations*, Applied Mathematics and Computation, in press.
- [J8] **D. D. Patterson**, S. A. Levin, A. C. Staver, J. D. Touboul, *Probabilistic foundations of spatial mean-field models in ecology and applications*, SIAM Journal on Applied Dynamical Systems, Vol. 19, No. 4 (2020), 2682–2719.
- [J7] J. A. D. Appleby and **D. D. Patterson**, *Blow-up and superexponential growth in superlinear Volterra equations*, Discrete & Continuous Dynamical Systems Series 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 Journal on Mathematical Analysis, Vol. 50, No. 2 (2018), 2086–2110.
- [J5] J. A. D. Appleby and **D. D. Patterson**, *Memory dependent growth in sublinear Volterra differential equations*, Journal of Integral Equations and Applications, 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*, Journal of Difference Equations and Applications, 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*, Applied Mathematics Letters, Vol. 71 (2017), 30–37.
- [J2] J. A. D. Appleby and **D. D. Patterson**, *Hartman–Wintner growth results for sublinear functional differential equations*, Electronic Journal of 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*, Electronic Journal of Qualitative Theory of Differential Equations, 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*, Electronic Journal of Qualitative Theory of Differential Equations, Proceedings of the 10th Colloquium on the Qualitative Theory of Differential Equations, 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 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

Academic Talks

Aug. 2020	<i>Swartz Foundation Meeting</i> , Seattle, USA (invited, cancelled)
Mar. 2020	<i>SIAM Life Sciences</i> , California, USA (cancelled)
Mar. 2020	<i>SIAM Mathematics of Planet Earth</i> , California, USA (cancelled)
Mar. 2020	<i>AMS Eastern Sectional Meeting</i> , Tufts University, USA (invited)
Oct. 2019	<i>ICMA VII</i> , Arizona State University, USA
Sep. 2019	<i>Dynamics Seminar</i> , Boston University, USA (invited)
May. 2019	<i>SIAM DS19</i> , Snowbird, Utah, USA
Apr. 2019	<i>Mathematics and Statistics Seminar</i> , University of Limerick, Ireland (invited)
July 2017	<i>Equadiff 2017</i> , Slovak University of Technology in Bratislava, Slovakia
May 2017	<i>SIAM UKIE Chapter Student Meeting</i> , NUI Galway, Ireland (Best Talk Prize)
Apr. 2017	<i>British Applied Mathematics Colloquium</i> , University of Surrey, UK
Mar. 2017	<i>Mathematics and Statistics Seminar</i> , University of Limerick, Ireland (invited)

July 2016	<i>11th AIMS Conference</i> , Orlando, Florida, USA
July 2015	<i>ICDEA 2015</i> , Białystok University of Technology, Poland
July 2015	<i>10QTDE</i> , Bolyai Institute, University of Szeged, Hungary
Dec. 2014	<i>SIAM Student Meeting</i> , NUI Galway, Ireland
July 2014	<i>10th AIMS Conference</i> , Universidad Autonoma de Madrid, Spain (invited)

Programming/Software

C++, MATLAB, Mathematica, XPP/Auto, Matcont, FreeFEM++, R, Hive, SQL, GeoGebra, L^AT_EX

Teaching Experience

Summer 2020	Lecturer , Differential Equations, Brandeis University (fully online)
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

Undergraduate Research Projects supervised:

Fall 2020	Jingman Li & Yuning Liu (Applied Math, Brandeis), “Network epidemic models”
Spring 2020	Hange Zhu (Applied Math, Brandeis), “Pattern formation in heterogeneous domains”
Summer 2019	Hanyu Song (Applied Math, Brandeis), “Mathematical models of somitogenesis”

Professional Activities & Affiliations

Selected for the AMS Mathematical Research Community “Dynamics of Infectious Diseases” (2020-2021)

Service

- Reviewer for *Applied Mathematics and Computation*, *Journal of Difference Equations and Applications*, *Electronic Journal of the Qualitative Theory of Differential Equations*, and *Mathematical Biosciences*
- Co-organized the minisymposium “Stochastic Networks in Neuroscience and Ecology” at the SIAM Conference on Applications of Dynamical Systems (DS21)
- Organized the Brandeis Mathematical Biology Seminar series 2018–2019
- Organized the DCU Mathematical Sciences Postgraduate Seminar series 2014–2017

Outreach

- Speaker for “MRSEC Pizza Talks” at Waltham High School (2020)
- Judge for SCUEM V 2020 (high school/undergraduate mathematical modeling competition)
- University coordinator for the BITE/DCU Voluntary Math Tuition programme 2017/2018 (math outreach to disadvantaged schools to promote university access through tutoring and mentorship)
- DCU Access Service tutor 2015/2016 (academic support for disadvantaged university students)

Professional Memberships

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

- Member of the International Society of Difference Equations (ISDE)
- Member of the American Association for the Advancement of Science (AAAS)