LAURA E WADKIN

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iD orcid.org/0000-0001-7355-2023   R^G Laura E Wadkin   in Laura E Wadkin

Interests: Mathematical biology, stochastic & agent based modelling, stem cells, population models

EDUCATION AND QUALIFICATIONS

Newcastle University   *2016–Present*
PhD in applied mathematics 'Modelling the formation of stem cell colonies'

Newcastle University   *2012–2016*
MMath Hons Mathematics, 1st
Awarded IMA graduate prize for outstanding performance

PRIZES

· Smith Institute TakeAIM Awards: 2nd Prize   *Feb 2020*
· Newcastle Applied Mathematics PGR Prize   *Jun 2019*
· ABTA Doctoral Researcher Awards: Honourable mention for doctoral work   *May 2019*
· London Mathematical Society Women in Mathematics Day: best poster   *Oct 2018*
· STEM for BRITAIN Silver Prize, presented in the House of Commons   *Mar 2017*
· IMA Graduation Prize for outstanding achievement   *Jun 2016*

RESEARCH AND TECHNICAL EXPERTISE

· **PhD Research project**: modelling the growth of human embryonic stem cell colonies. I am working to develop mathematical models of stem cell behaviour using specialist experiments conducted at the Institute of Genetic Medicine, Centre for Life. Using a wide range of modelling techniques including agent based and stochastic differential equations, together with statistical analysis of experimental data the aim is to develop comprehensive models of colony growth from a single cell. I have published two papers from this work and am currently working on a third, presented a poster at two international conferences and won a prize in the STEM for BRITAIN awards.

· Proficient at Matlab, R, LaTeX with experience in Fortran and HPC

· Trained in the use of ImageJ, IMARIS 3D/4D Microscope analysis software

PUBLICATIONS

· L. E. Wadkin *et al.*, An introduction to the mathematical modelling of iPSCs. Submitted for Induced Pluripotent Stem Cells: Novel Concepts, Elsevier (2020).

> A chapter conveying the importance and usefulness of mathematical modelling as a tool to achieve a deeper understanding of stem cell biology, introducing key mathematical concepts (random walk theory, differential equations and agent-based modelling) for non-mathematical readers.

· L. E. Wadkin *et al.*, Dynamics of temporal OCT4 regulation in human embryonic stem cells. arXiv e-prints, page arXiv:2004.09133 (2020).

> An analysis of the temporal behaviour of the pluripotency transcription factor OCT4, quantifying its intra-cellular self-regulation and fluctuations. The quantitative framework provides a basis for experimental comparison and developments of mathematical models.

· L. E. Wadkin *et al.*, The recent advances in the mathematical modelling of human pluripotent stem cells. SN Applied Sciences 2, 276 (2020).

> A review of the recent developments in the mathematical modelling of the key behaviours of pluripotent stem cells, suitable for both biologists and mathematicians.

· L. E. Wadkin *et al.*, Seeding hESCs to achieve optimal colony clonality, Sci. Rep. 9, 15299 (2019).

> A stochastic exponential growth model for colony formation is developed based on experimental data. The average time at which clonality is lost *in-vitro* for different initial seeding conditions is presented as a diagnostic tool for biologists.

· L. E. Wadkin *et al.*, Correlated random walks of human embryonic stem cells *in-vitro*, Phys. Biol. 15, 056006 (2018).

> The individual motions of single and pairs of cells from experimental data are analysed. The correlated random walks and super-diffusive behaviour of cells is presented.
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> University press release, 'How stem cells move'. (Jun 18)

· L. E. Wadkin *et al.*, Dynamics of single human embryonic stem cells and their pairs: a quantitative analysis, Sci. Rep. 7, 570 (2017)

> Important parameters of the movement of single and pairs of cells, such as velocities, diffusivity and correlation times are extracted from analysis of experimental data.

TALKS

· British Applied Mathematics Colloquium, 'Mathematical modelling of hESCs to optimise clonality'. University of Bath (Apr 2019).
· British Young Mathematicians Colloquium, 'Mathematical modelling of hESCs to optimise clonality'. Birmingham University (Apr 2019).
· Applied Postgraduate Conference, 'Modelling hESC colony formation'. Newcastle University (Jun 2017, 18 and 19).
· Stem Cell Biology Research Group, 'Human stem cell colony formation: a mathematical modelling approach'. Institute for Genetic Medicine (Nov 16).

POSTERS

· 'Optimising stem cell clonality' presented at LMS Research School: PDEs in Mathematical Biology (ICMS Edinburgh, May 2019) and ABTA Doctoral Researcher Awards (University College London, May 2019).
· 'Human embryonic stem cell colony formation' presented at LMS Women In Mathematics Day. Prize for best poster (Newcastle University, Oct 2018).

- · 'Modelling stem cell colony formation' presented at the UK Conference on Multiscale Biology (Nottingham University, Apr 2018), and the Collective dynamics and self-organisation in biological sciences workshop (ICMS Edinburgh, May 2018).
- · 'Mathematical modelling of stem cell colonies' at STEM for BRITAIN competition, presented to MPs in the House of Commons. Won Silver prize (Mar 2017).

COURSES

- · ACTION for Impact Training, Newcastle & Durham Universities, three day residential (July 2019).
- · The Introduction to Learning & Teaching in Higher Education programme, one day course, Newcastle University (Sep 2017).
- · The Academy for PhD Training in Statistics
  Cambridge week: Statistical Inference and Computing (Dec 2016).
  Oxford week: Applied Stochastic Processes and Statistical Modelling (Mar 2017).
- · Hands-on Introduction to HPC, ARCHER, two day course (Dec 2016).

TEACHING

- · Lecturer for PHY1032 Algebra (Semester 1 19/20)
- · Lead PARTNERS Summer School lectures on Algebra and Functions (2019)
- · Lead MAS2802 Differential Equations problems classes and office hours (Semester 2, 18/19).
- · MRES mini-module, Agent Based Modelling (designed, delivered, marked) (Semester 1, 18/19).
- · Demonstrating/marking for the school of Mathematics, Statistics and Physics (2016–present).

EDI AND OUTREACH

- · Organised Applied Postgraduate Conference (2019).
- · Leading on-going gender equality research project investigating qualitatively the effect of gender on retention rates in mathematics (2018–present).
- · Silver grade STEM ambassador undertaking outreach activities in local schools (2016–present).
- · Speaker at WISDOM event for Y9/10 girls and their parents encouraging women in STEM (2017).
- · Outreach committee member (2017–present).