Dr. Thomas Tunstall, PhD, MSci

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PERSONAL PROFILE

A postdoctoral research fellow with a PhD in Physics from the University of Exeter and an MSci Theoretical Physics from the University of Birmingham. Currently engaged with a wide variety of mathematical modelling, from dynamical systems analysis of cardiomyocytes to mechanistic modelling of bacteria grown in coculture. I have a particular interest in spatial evolution models, as I engaged with during my PhD.
Passionate about studying, simulating, and analysing dynamical systems of all types, with an emphasis on biological physics and mathematical ecology.

SKILLS

Applied Mathematics	PDE Solving, Network Modelling, Dynamical Systems, Geometrical Analysis.
Simulation coding	2D surface growth models; Stochastic, individual-based simulation of pests; Voter models on a random network; Dynamical systems
Programming Languages	Python (NumPy, Scikit-learn, Matplotlib, NetworkX, AUTO-07P), C++, HTML/CSS.
Teaching	University (supervised Mathematics for Physicists problem classes for Years 1 and 2). Secondary School (with the Ogden Trust). See below for more extensive overview.
Technical	Linux, Bash, Latex (Overleaf/ Markdown), Microsoft Office, Git, HTML/CSS.
Established Skills	Presentation skills; Teamwork; Time management; Multi-tasker; Attention to detail; Self-motivation.

PUBLICATIONS

PUBLISHED:

"***How Social Network Structure Impacts the Ability of Zealots to Promote Weak Opinions."***
Thomas Tunstall, 2025
DOI: https://doi.org/10.1103/PhysRevE.111.024311

"***Evolutionary rescue in resistance to pesticides."***
Philip Madgwick, Thomas Tunstall, Ricardo Kanitz 2024
DOI: https://doi.org/10.1098/rspb.2024.0805

"***Assisted percolation of slow-spreading mutants in heterogeneous environments."***
Thomas Tunstall, Tim Rogers, Wolfram Möbius, 2023
DOI: https://doi.org/10.1103/PhysRevE.108.044401

PRE-PRINTS:

"***Competition with Pseudomonas aeruginosa induces Staphylococcus aureus in an antibiotic-tolerant viable but non culturable state"***

Lapinska et al, 2025
DOI: https://doi.org/10.1101/2025.04.30.651255

"***Tuning Spatial Distributions of Selection Pressure to Suppress Emergence of Resistance"***

Thomas Tunstall, Philip Madgwick, Wolfram Möbius, 2024
DOI: https://doi.org/10.1101/2024.10.23.619847

Postdoctoral Research

Postdoctoral Research Fellow

Feb 2024 – Aug 2025 **University of Exeter, UK**

Mathematical Modelling

- Mechanistic modelling of bacterial growth, with particular interest to coculture of microbial species.
- Comparing the difference in bifurcation diagrams for a variety of spatially extended models of cardiomyocyte excitation.

EXPERIENCE

Syngenta Crop Protection

Apr – Jul 2022 **BRACKNELL, UK**

Internship

- Working closely with industry specialists from a range of backgrounds, lending my mathematical expertise towards modelling the effects of pesticide application.
- Presented my work to an audience of specialists and non-specialist on a regular basis.

Imperial College London

Jul – Sept 2018 **LONDON, UK**

Summer Student, Software Engineer

Built a simulation in C++ to verify whether the adiabatic change in a 3-D potential well could result in the exponential increase in the energy of a constrained quantum particle.

- **Technical Skills:** C++ in collaboration with Python with NumPy and Matplotlib, Ubuntu Linux
- **Soft Skills:** Time management, Communication, Presentation skills.

Queen Mary University of London
Jul - Sept 2017 **LONDON, UK**
Summer Student, Software Engineer
In collaboration with SNOLab, I amended a variety of out-dated or erroneous scripts to aid with the calibration of the SNO+ detector.

- **Technical Skills:** C++, Python (with NumPy and Matplotlib), Perl, Ubuntu Linux, Navigating ROOT data structure.
- **Soft Skills:** Teamwork, Time management, Communication.

EDUCATION

University of Exeter
Sept 2019 - April 2024 **EXETER, UK**
PhD in Physics *(Funded by EPSRC DTP and Syngenta Crop Protection)*

- Project title: Initially 'Hindering evolution of resistance to pesticides through optimizing landscape structure and application practise', later 'Evolution in the face of spatial heterogeneity'.
- Experience in leading Mathematics for Physicists problem classes.
- Internship with Syngenta Crop Protection.
- Captain of the intramural Postgraduate Basketball team.

University of Birmingham
Sept 2015 - Jul 2019 **BIRMINGHAM, UK**
MSci Theoretical Physics

- Graduated with First-Class Honours

Teaching & Outreach

Minisymposium chair, BMC-BAMC 2025
June 2025 **University of Exeter, UK**
Spatial and temporal models of ecology and evolution

- Co-organise and co-chair six talks covered the depth and breadth of mathematical models of evolution with emphasis on spatial or temporal heterogeneity.

Physics Problem Class Leader
Winter Term, 2021 **University of Exeter, UK**
PHY1025: Mathematics Skills

- Leading problem classes for first year physics students. Included marking problems, and leading hour-long workshops to explore common mistakes, and develop more examples.
- Subjects: algebra, trigonometry, matrices, calculus, series expansions, and complex numbers.

Physics Problem Class Leader

Sept 2020 - April 2021 **University of Exeter, UK**

PHY2025: Mathematics with Physical Applications

- Leading problem classes for second year physics students, both in-person and remotely due to covid concerns. Included marking problems, and leading hour-long workshops to explore common mistakes, and develop more examples.
- Subjects: probability theory, Lagrangian dynamics, linear PDEs, linear algebra.

Secondary School Teaching Volunteer with the OGDEN Trust

Jun - Jul 2017 **CAMBRIDGE, UK**

Supervised and assisted teaching of years 7-9. Culminated in teaching a few Physics lessons and receiving constructive criticism after each to improve. Taught primary-school students Astronomy.

References available upon request:

- **Wolfram Möbius,** *University of Exeter*: w.moebius@exeter.ac.uk
- **Tim Rogers,** *University of Bath*: ma3tcr@bath.ac.uk
- **Ricardo Kanitz,** *Syngenta Crop Protection*: ricardo.kanitz@syngenta.com