Thomas M. Bury

Curriculum Vitae

Department of Physiology
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Summary of Qualifications

- Publications in high-impact journals (PNAS, PLOS Computational Biology)
- Invited speaker at TEDx and other large conferences
- Research broadcasted by national and international media outlets
- Instructor of an undergraduate class of 115 students which received excellent student reviews

Education

2015-2019 **PhD, Applied Mathematics**, *University of Waterloo*
Thesis: Detecting and distinguishing transitions in ecological systems: Model and data-driven approaches.
GPA: 96.4%
Advisors: Dr. Chris Bauch, Dr. Madhur Anand

2011–2015 **BA, MMATH, Mathematics**, *Queens' College, University of Cambridge*
First class honours. Courses included theoretical and biological physics.
Director of studies: Prof. Julia Gog OBE

Research Experience

2020-current **Postdoctoral Researcher**, *Dept. of Physiology, McGill University*
- Developed web application in Python for interactive visualisation and analysis of long ECG recordings from patients with abnormal heart rhythms. Currently deployed on the Compute Canada cloud.
- Developing mathematical models to better understand mechanisms and consequences of premature ventricular contractions in patients.

2015-2019 **Doctoral Researcher**, *Dept. of Applied Mathematics, University of Waterloo*
- Developed theory and software to provide early warning signals of bifurcations in time series data.
- Analysed empirical data from laboratory population experiments, which verified advantages of our software over traditional methods.
- Constructed and analysed a novel model for climate change coupled to social processes. Received international media attention.

2014 Jun-Aug **Undergraduate Researcher**, *DAMTP, University of Cambridge*
- Curated and analysed incidence data from the 2009 Influenza pandemic.
- Provided data visualisations for public health professionals at Addenbrooke's Hospital, Cambridge.

Conferences

Invited speaker

Jul 2020 Workshop on Critical Transitions in Complex Systems, Shanghai Institutes for Biological Sciences

Aug 2018 Ecological Society of America (ESA) Annual Meeting, New Orleans, Louisiana, US

Sep 2017 TEDx, University of Toronto

Contributed talks

Jun 2019 Canadian Society of Applied and Industrial Mathematics (CAIMS) Annual Meeting, Whistler, British Columbia, Canada

Jan 2018 Dynamics Days, Denver, Colorado, US

Aug 2017 Applied Mathematics, Modeling and Computational Science (AMMCS) International Conference, Waterloo, Ontario, Canada

Jul 2017 Mathematical Models in Ecology and Evolution (MMEE), London, UK

May 2017 Waterloo Institute for Complexity and Innovation (WICI), Interdisciplinary Conference on Resilience in Complex Natural and Human Systems, Waterloo, Ontario, Canada

Poster presentations

Jul 2019 Society for Mathematical Biology (SMB) Annual Meeting, Montréal, Quebec, Canada

Invited seminars

Dec 2020 University of Ottawa Applied Mathematics Seminar

Sep 2020 McGill Seminar Series in Quantitative Life Sciences and Medicine

May 2020 Centre de Recherches Mathématiques (CRM), Université de Montréal

Publications

Journal articles

P1 T. M. Bury, C. T. Bauch, and M. Anand. Detecting and distinguishing tipping points using spectral early warning signals. *Journal of the Royal Society Interface*, 17(170):20200482, 2020.

P2 T. M. Bury, C. T. Bauch, and M. Anand. Charting pathways to climate change mitigation in a coupled socio-climate model. *PLOS Computational Biology*, 15(6):e1007000, 2019.

P3 A. D. Pananos, T. M. Bury, C. Wang, J. Schonfeld, S. P. Mohanty, B. Nyhan, M. Salathé, and C. T. Bauch. Critical dynamics in population vaccinating behavior. *Proceedings of the National Academy of Sciences*, 114(52):13762–13767, 2017.

In review

T. M. Bury, C. Lerma, G. Bub, Z. Laksman, M.D., M. Deyell, M.D. and L.Glass. Long ECGs reveal rich and robust dynamical regimes in patients with frequent ectopy, *Chaos: An Interdisciplinary Journal of Nonlinear Science.*

Selected Media Coverage

My lead-author publications have featured in national and international news outlets, including

- CityNews (Toronto)
- The Globe and Mail (Canada)
- The National Post (Canada)
- The Business Standard (India)
- Greenreport (Italy)

Software

S1 T. M. Bury, ewstools, *https://github.com/ThomasMBury/ewstools*
A Python package for computing, analysing and visualising early warning signals in time-series data. Includes spectral early warning signals, a novel approach to distinguishing, as well as detecting bifurcations.

Awards and Grants

May 2020 CAMBAM postdoctoral fellowship ($7000) *McGill University*

Aug 2019 Doctoral thesis award ($5000) *University of Waterloo*

May 2019 Combined travel grants ($2500) *Waterloo Institute for Complexity and Innovation*

Nov 2017 Research dissemination award ($500) *University of Waterloo*

Apr 2017 Public speaking award ($300) *Fields Thesis Competition*

Feb 2017 First place at faculty round ($100) *Three-Minute-Thesis competition*

Teaching

Positions held

Fall 2018 **Course Instructor**, *University of Waterloo*
- Course : Calculus I for the Sciences, 115 students, 1 teaching assistant
- Contributions: Designed and implemented lectures three times a week, contributed to exam and project development, manager of teaching assistant and tutorial sessions.
- Student evaluations: Very strong (>4.5/5 average for each teaching aspect)

Fall 2016 **Lead Teaching Assistant**, *University of Waterloo*
- Course : Calculus I for Engineers, 667 students, 11 teaching assistants
- Contributions: designed weekly problem sheets with solutions for the course, ran interactive tutorial sessions, held office hours, marked and proctored exams

Winter 2018 **Teaching Assistant**, *University of Waterloo*
- Course : Stochastic processes in the physical sciences, 15-20 graduate students, 1 teaching assistant
- Contributions: lectured specialist topics, provided sample code with live demonstrations, extended course notes, marked assignments

Certifications

2017-2019 **Certificate of University Teaching**, *University of Waterloo*
A two-year teaching course for PhD students. Includes multiple teaching observations, guided self-reflection and improvement, workshops and a pedagogical research project. Teaching dossier available on request.

2016-2017 **Fundamentals of University Teaching**, *University of Waterloo*
Pre-requisite to the former. Involves weekly workshops and 'microteaching' assessments.

Service

Service to Profession

2019-current **Peer review**
Served as a reviewer for the journal *Climatic Change*.

2017-2018 **Senate Graduate and Research Council**, *University of Waterloo*
Math grad student representative for matters of academic quality and research activity within the university.

Workshops

July 2020 CAMBAM-QLS: Interactive data visualisation in Python
Designed and implemented 5-hour workshop on Zoom. Involved Jupyter notebooks with exercises and public datasets for participants. Received sustained attendance of over 60 participants.

May 2018 WICI: A Hands-on Introduction to Mathematical Modelling
Co-designed and implemented for conference 'Leveraging systems approaches to improve human and planetary health' hosted by the Waterloo Institute for Complexity and Innovation.

Community outreach

2016-2019 Let's Talk Science: National, charitable organisation for STEM outreach across schools in Canada. Volunteered on school visits to demonstrate physics concepts to children in Grades 4-6.

Mar 2017 Centennial Public School, Waterloo: Science fair judge for Grade 8 projects.

Memberships

Society for Industrial and Applied Mathematics
Waterloo Institute for Complexity and Innovation
Institute of Mathematics and its Applications

Programming skills

Python, Bash, Matlab, Mathematica, AUTO	*strong*
C, R, HTML, CSS	*proficient*

Languages

English	*native*
French	*conversational / B2*

References

Dr. Leon Glass
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