

Thomas Bury

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Last updated: October, 2024
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EDUCATION

- 2015 – 2019 **PhD, Applied Mathematics**, University of Waterloo, Canada
Thesis: Detecting and distinguishing transitions in ecological systems: model and data-driven approaches.
Advisors: Dr. Chris Bauch, Dr. Madhur Anand
- 2014 – 2015 **MMATH, Mathematics**, University of Cambridge, UK
Director of studies: Dr. Julia Gog, OBE
- 2011 – 2014 **BA, Mathematics**, University of Cambridge, UK

PROFESSIONAL APPOINTMENTS

- 2020 – present **Postdoctoral Researcher**
Department of Physiology
Faculty of Medicine
McGill University, Canada

GRANTS AND FELLOWSHIPS

- 2023 – 2026 (Collaborator) NWO Vidi grant - To tip, or not to tip, that is the question (800,000 euros)
- 2022 – 2025 FRQNT postdoctoral research scholarship (\$135,000)
- 2020 – 2022 CAMBAM postdoctoral fellowship, Centre for Applied Mathematics in Bioscience and Medicine, McGill University (\$17,000)

AWARDS & HONORS

- 2024 Post-Graduate Studnets' Society travel award, McGill University (\$500)
- 2023 Centre de recherche en biologie structurale travel award, McGill University (\$1,000)
- 2021 PNAS [Cozzarelli Prize](#) for scientific excellence and originality—finalist
- 2019 Doctoral thesis award, University of Waterloo (\$5000)
Combined travel grants, Waterloo Institute for Complexity and Innovation (\$2500)
- 2017 Research dissemination award, GRADTalks, University of Waterloo (\$500)

Second place at Fields Thesis Competition, Fields Institute, Toronto (\$300)

Finalist at 3-Minute Thesis competition, University of Waterloo (\$100) ([recording](#))

PUBLICATIONS

SUBMITTED


- 2024 A. Osakwe, N. Wightman, M. Deyell, Z. Laksman, A. Shrier, G. Bub, L. Glass and **T. Bury**. Dependence of premature ventricular complexes on heart rate—it's not that simple. *Journal of the American Medical Informatics Association*. (Undergoing peer review).
- Z. Ma, C. Zheng, Y. Zhang and **T. Bury**. Learning from the past: predicting critical transitions with machine learning trained on surrogates of historical data. *Communications Physics*. (Undergoing peer review).

PUBLISHED

- 2024 M. Sadria and **T. Bury**. FateNet: an integration of dynamical systems and deep learning for cell fate prediction. *Bioinformatics*, 40(9), btae525. ([manuscript](#)) ([code](#))
- 2023 **T. Bury**, K. Diagne, D. Olshan, L. Glass, A. Shrier, B. Lerman and G. Bub. The Inverse Problem for Cardiac Arrhythmias. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 33(12). ([manuscript](#)) ([code](#))
- T. Bury**, D. Dylewsky, C. Bauch, M. Anand, L. Glass, A. Shrier and G. Bub. Predicting discrete-time bifurcations with deep learning. *Nature Communications*, 14(1), 6331. (**Editors' highlight**) ([manuscript](#)) ([code](#))
- T. Bury**. ewstools: A Python package for early warning signals of bifurcations in time series data. *Journal of Open Source Software*, 8(82), 5038. ([manuscript](#)) ([code](#))
- K. Diagne, **T. Bury**, M. Deyell, Z. Laksman, A. Shrier, G. Bub and L. Glass. Rhythms from two competing periodic sources embedded in an excitable medium. *Physical Review Letters*, 130(2), 028401. (**Editors' suggestion**) ([manuscript](#))
- Press: [APS Physics](#), [PNAS news](#), [Physics Today](#)
- 2022 F. Dablander and **T. Bury**. Deep learning for tipping points: Preprocessing matters. *Proceedings of the National Academy of Sciences*, 119(37), e2207720119. ([manuscript](#))
- D. Dylewsky, T. Lenton, M. Scheffer, **T. Bury**, C. Fletcher, M. Anand, and C. Bauch. Universal early warning signals of phase transitions in climate systems. *Journal of the Royal Society Interface*, 20(201), 20220562. ([manuscript](#))
- 2021 **T. Bury**, R. Sujith, I. Pavithran, M. Scheffer, T. Lenton, M. Anand, and C. Bauch. Deep learning for early warning signals of tipping points. *Proceedings of the National Academy of Sciences*, 118(39), e2106140118. (**Cozzarelli finalist**) ([manuscript](#)) ([code](#))
- Press: [PNAS commentary](#), [The Independent](#), [The Daily Mail](#)
- J. Menard, **T. Bury**, C. T. Bauch, and M. Anand. When conflicts get heated, so does the planet: coupled social-climate dynamics under inequality. *Proceedings of the Royal Society B*, 288(1959), 20211357. ([manuscript](#))

- 2020 **T. Bury**, C. Lerma, G. Bub, Z. Laksman, M. W. Deyell, L. Glass. Long ECGs reveal rich and robust dynamical regimes in patients with frequent ectopy. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 30(11). ([manuscript](#))
- T. Bury**, C. T. Bauch, M. Anand. Detecting and distinguishing tipping points using spectral early warning signals. *Journal of the Royal Society Interface*, 17(170), 20200482. ([manuscript](#))
- 2019 **T. Bury**, C. T. Bauch, M. Anand. Charting pathways to climate change mitigation in a coupled socio-climate model. *PLoS Computational Biology*, 15(6), e1007000. ([manuscript](#)) ([code](#))
- Press: [Globe and Mail](#), [CityNews](#)
- D. A. Pananos, **T. Bury**, C. Wang, J. Schonfeld, S. P. Mohanty, B. Nyhan, M. Salathé, C. T. Bauch. Critical dynamics in population vaccinating behavior. *Proceedings of the National Academy of Sciences*, 114(52), 13762-13767. ([manuscript](#))
- Press: [CBC](#), [Science Daily](#)

OPEN-SOURCE SOFTWARE

- 2019 – present **ewstools**
- A Python package for computing early warning signals for bifurcations in time series data
- Role: Creator, core developer
 - GitHub:  [ThomasMBury/ewstools](#), 72 stars

INVITED SEMINARS

- 2024 Centre de Recherche du Centre Hospitalier de l'Université de Montréal (CRCHUM), Elie Bou Assi lab, Montréal, QC, 6 June
- Montreal Institute for Learning Algorithms (MILA), Montréal, QC, 31 May ([recording](#))
- IFMSA-Quebec Global Health Symposium, Montréal, QC, 24 May
- Waterloo Institute for Complexity and Innovation (WICI), Waterloo, ON, 2 May ([recording](#))
- 2023 Youreka Canada Symposium, Keynote speaker, Montréal, QC, 28 April
- 2020 Centre de Recherches Mathématiques (CRM), Université de Montréal, 11 May ([recording](#))
- Dept. of Applied Mathematics, University of Ottawa, 26 November

CONFERENCE PRESENTATIONS

- 2024 SIAM Conference on Mathematics of Data Science, Atlanta, GA, 21-25 October - upcoming (**mini-symposium organiser**)
- SIAM Annual Meeting, Spokane, WA, 8-12 July (**invited, mini-symposium**)
- 2023 Workshop: Challenges of predicting critical transitions in natural systems, Exeter University, UK, 7-8 December (**invited plenary**)

SIAM Conference on Applications of Dynamical Systems, Portland OR, 14-18 May (**invited, mini-symposium**)

- 2021 Dynamics Days Europe, Virtual, 23-27 August
Society for Mathematical Biology Annual Meeting, Virtual, 13-17 June
- 2020 Workshop on Critical Transitions in Complex Systems, Shanghai Institute for Biological Sciences, Virtual, 29-31 July (**invited**)
- 2019 Society for Mathematical Biology Annual Meeting, Montréal, Canada, 22-26 July (poster)
Canadian Society of Applied and Industrial Mathematics Annual Meeting, Whistler, Canada, 9-13 June
- 2018 Ecological Society of America, Annual Meeting, New Orleans, U.S. 5-10 August
Dynamics Days US, Denver, U.S. 4-6 January
- 2017 TEDx UofT, Toronto, Canada, 13 September ([recording](#))
Applied Mathematics, Modeling and Computational Science, International Conference, Waterloo, Canada, 20-25 August
Mathematical Models in Ecology and Evolution, Conference, London, UK, 10-12 July
WICI Interdisciplinary Conference on Resilience in Complex Natural and Human Systems, Waterloo, Canada, 16-17 May

DEPARTMENTAL TALKS

- 2024 Centre de Recherche en Biologie Structurale Seminar Series, McGill University, 22 March
- 2021 Department of Physiology Seminar Series, McGill University, 22 January
- 2020 Seminar Series in Quantitative Life Sciences and Medicine, McGill University, 22 September

TEACHING

GRADUATE

- 2021 – 2022 **Instructor**, *McGill University*
QLSC 600D1: Foundations of Quantitative Life Sciences. Module: Resetting and entraining of biological rhythms, 15-20 students (Fall 2021, Fall 2022)
- 2017 – 2018 **Teaching Assistant**, *University of Waterloo*
AMATH 777: Stochastic Processes in the Physical Sciences (Winter 2017, Winter 2018)
MATH 650: Mathematical Modeling with Differential Equations (Fall 2017)

UNDERGRADUATE

- 2024 **Guest Lecturer**, *McGill University*
BIOL 309: Mathematical Models in Biology, 80 students (Fall 2024)

- 2018 **Instructor**, *University of Waterloo*
MATH 127: Calculus I for the Sciences, 110 students (Fall 2018)
- 2015 – 2018 **Teaching Assistant**, *University of Waterloo*
AMATH 353: Partial Differential Equations (Winter 2018)
AMATH 350: Differential Equations for Business and Economics (Winter 2017)
AMATH 250: Introduction to Differential Equations (Winter 2016)
MATH 116: Calculus I (Fall 2015, Summer 2016, Fall 2016)

SUMMER SCHOOLS AND WORKSHOPS

- 2021 **Technical lead**, Summer School in Nonlinear Dynamics for the Life Sciences, McGill University (virtual), 31 May - 11 June
- 2020 **Workshop creator and facilitator**, Interactive Data Visualisation in Python, McGill University (virtual), 27 July ([GitHub](#))
- 2018 **Workshop co-creator and co-facilitator**, A Hands-on Introduction to Mathematical Modelling, Waterloo Institute for Complexity and Innovation, 26 April

CREDENTIALS

- 2017 – 2019 Certificate of University Teaching, *University of Waterloo*
- 2015 – 2016 Fundamentals of University Teaching, *University of Waterloo*

STUDENT SUPERVISION

DOCTORATE

- 2019 – present Khady Diagne (co-supervisor)
McGill University
Project: Spatio-temporal dynamics of pure parasystole in cardiac tissue

UNDERGRADUATE

- 2020 – 2021 Alix Vanpoperinghe (supervisor)
McGill University
Project: Simulation of cardiac monolayers under optogenetic control
- 2020 – 2021 Glisant Plasa (co-supervisor)
McGill University
Project: Reinforcement learning for discovery of reentry mechanisms in cardiac tissue

ACADEMIC SERVICE

PROFESSIONAL

- 2024 EDIA Champions Merit Review Committee, *Digital Research Alliance of Canada*

Organiser of mini-symposium “Early warning signals in medicine”, *SIAM Conference on Mathematics of Data Science*

2021 – present Evaluation committee member for the 2021, 2022 and 2023 Tri-Agency Canada Graduate Scholarship-Master’s competition, *McGill University*

2017 – 2018 Math graduate student representative, Senate Graduate and Research Council, *University of Waterloo*

OUTREACH

Ongoing Interviews with *The Scientific American*, *The Waterloo Region Record*, *The McGill Tribune* and *The Charlatan*

Ongoing Technical author for [Towards Data Science](#), Medium publication

2024 Career panelist at the McGill Quantitative Life Sciences Research Day

2023 Lecture to CEGEP students at Youreka Canada. “Data science: practice and principles”. Montréal, Canada

Poster judge for the Faculty of Medicine and Health Sciences Student Research Day. *McGill University*, Montréal, Canada

2022 – 2023 Poster judge for the Quantitative Life Sciences Research Day in 2022 and 2023. *McGill University*, Montréal, Canada

2022 Lecture to high school students at Kelly College. “Mathematics beyond school: university, careers and life”. Devon, UK

2016 – 2018 Workshop facilitator at primary school visits. *Let’s Talk Science*, Waterloo, Canada

2017 [TEDx speaker](#). *University of Toronto*, Toronto, Canada

Volunteer at Physics Lab Day for Grade 11-12. *University of Waterloo*, Waterloo, Canada

Science fair judge for Grade 8 projects. *Centennial Public School*, Waterloo, Canada

REVIEWER

Nature, Nature Communications, Nature Climate Change, Proceedings of the National Academy of Sciences (PNAS), Physical Review X, Ecology Letters, Proceedings of the Royal Society A/B, Journal of the Royal Society Interface, Royal Society Open Science, npj Systems Biology and Applications, Wiley: Ecology and Evolution, Wiley: Methods in Ecology and Evolution, Chaos: An Interdisciplinary Journal of Nonlinear Science, Physica D: Nonlinear Phenomena, Ecological Economics, Climatic Change, PLOS One

LANGUAGES

English Native

French Proficient : TEFaQ Level C1 obtained in 2020