Richard Creswell

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Oxford, England

Research Interests

- Bayesian inference for challenging time series models.
- Epidemiology and computational biology of infectious diseases.
- Efficient inference for applied Bayesian nonparametrics.

Education

Doctor of Philosophy, **Computer Science** (in progress; anticipated Q2, 2023)
University of Oxford, Oxford, England

Master of Science, **Applied Mathematics**
Columbia University, New York, New York

Bachelor of Science, **Applied Physics *summa cum laude***
Columbia University, New York, New York

Research Positions

Doctoral Student 2019 Oct.–present
University of Oxford, Oxford, England

- Supervisor: Professor David Gavaghan.
- Co-supervisors: Ben Lambert, Simon Tavener, Martin Robinson, Chon Lok Lei.
- Bayesian inference for time series models, particularly differential equation models arising in computational biology, and deterministic and stochastic models of the spread of infectious diseases.

Research Associate 2017 July–2019 Sep.
Massachusetts Host-Microbiome Center, Brigham & Women's Hospital,
Harvard Medical School, Boston, Massachusetts

- Supervisor: Professor Georg Gerber.
- Machine learning and Bayesian nonparametric models for time series of the gut microbiome.
- Bioinformatic analysis of metagenomic data.

Undergraduate Research Assistant 2014 May–2015 Jan.
Columbia University, New York, New York

- Supervisor: Professor Irving Herman.
- Time-dependent properties of luminescent nanoparticles passivated by graphene.

Teaching Experience

Teaching Demonstrator 2020 Oct.–present
University of Oxford, Oxford, England

- I worked as a teaching assistant on the following modules:
  - SABS Software engineering (2020–2021, 2021–2022).
  - SABS Mathematical modelling (Michaelmas 2020).
  - SABS Scientific computing (Hilary 2021).

- SABS Simulated data and reproducible data analysis (Summer 2021).
- UNIQ+ Machine Learning and Bayesian Inference training session (Summer 2021).

- Both years that I worked on the software engineering module, I led the students in extending their open source software assignments into publishable research projects.

Mentorship 2021 Apr.–present

University of Oxford, Oxford, England

- Co-supervisor for the following postgraduate students in Professor Gavaghan's research group:
  - Ioana Bouros (rotation and PhD, 2021–).
  - Katherine Shepherd (rotation, 2022).
  - Kit Gallagher (rotation, 2022).

Script Writer 2013 Jan.–2014 Jan.

openlectures, New York, New York

- This startup was producing concise, freely accessible online video lectures for high school students. I wrote scripts for various topics in the science and mathematics curriculum.

Other Experience

CoMo-DTC COVID-19 Collaboration, Member of Organizing Team 2020 Oct.–2022 Mar.

- I joined the organizing team for the collaboration between Oxford's and Cornell's COVID-19 International Modelling Consortium (CoMo) and the Doctoral Training Centre (DTC) at Oxford.
- Our work included investigating the development of high-quality software for CoMo's model of COVID-19 transmission, and implementing a hierarchy of compartmental transmission models for purposes of model comparison. Some of this was published in *Mathematical Biosciences* (van der Vegt et al., 2022).

Member of Conference Organizing Committee 2021 Sep.–2022 June

- I worked on the organizing committee for the conference "Inference for Expensive Systems in Mathematical Biology" held at Oxford on May 23–24, 2022.
- To fund the conference, the committee raised **£5000** from the London Mathematical Society, **£4000** from the Heilbronn Institute, and **£1000** from the Oxford Computer Science department.

Skills

Programming: Python, C, C++, R, MATLAB.
Other computing: MPI, Unix/Linux, SQL, Git, LSF, Slurm, AWS EC2, object-oriented programming, software testing, continuous integration.
Design and web: LaTeX, Blender, Illustrator, Inkscape, matplotlib, Plotly Dash, Flask.

Honors, Awards, and Funding

- EPSRC Doctoral Prize (2022)—**£27,221** funding to continue research at Oxford after finishing my DPhil.
- Invited one-week research visit to Colorado State University, Fort Collins (2022).
- Computer Science Scholarship (Oxford Department of Computer Science, 2019).
- EPSRC Doctoral Training Partnership (2019).
- Applied Physics Faculty Award (Columbia University, 2016).
- C. Prescott Davis Scholar (Columbia University, 2016).

References

- David Gavaghan (Professor of Computational Biology, University of Oxford).
  david.gavaghan@dtc.ox.ac.uk
- Ben Lambert (Senior Lecturer of Mathematics, University of Exeter).
  ben.c.lambert@gmail.com
- Simon Tavener (Professor of Mathematics, Colorado State University).
  tavener@math.colostate.edu

Publications and Presentations

Journal papers

- **R. Creswell,**† D. Augustin,† I. Bouros,† H. J. Farm,† S. Miao,† A. Ahern,† M. Robinson, A. Lemenuel-Diot, D. Gavaghan, B. Lambert, and R. N. Thompson: "Heterogeneity in the onwards transmission risk between local and imported cases affects practical estimates of the time-dependent reproduction number," Accepted by *Philosophical Transactions of the Royal Society, A* (2022).
- S. A. van der Vegt,† L. Dai,† I. Bouros,† H. J. Farm,† **R. Creswell,**† O. Dimdore-Miles,† I. Cazimoglu, S. Bajaj, L. Hopkins, D. Seiferth, F. Cooper, C. L. Lei, D. Gavaghan, and B. Lambert: "Learning transmission dynamics modelling of COVID-19 using comomodels," *Mathematical Biosciences,* vol. 349 (2022).
- **R. Creswell,**† J. Tan,† J. W. Leff, B. Brooks, M. A. Mahowald, R. Thieroff-Ekerdt, and G. K. Gerber: "High resolution temporal profiling of the human gut microbiome reveals consistent and cascading alterations in response to dietary glycans," *Genome Medicine,* vol. 12 (2020).
- E. Bogart, **R. Creswell,** and G. K. Gerber: "MITRE: inferring features from microbiota time-series data linked to host status," *Genome Biology,* vol. 20 (2019).
- D. Zhang, D. Z.-R. Wang, **R. Creswell,** C. Lu, J. Liou, and I. P. Herman: "Passivation of CdSe Quantum Dots by Graphene and MoS_2 Monolayer Encapsulation," *Chemistry of Materials,* vol. 27, no. 14, pp. 5032–5039 (2015).

(†= joint first authorship.)

Conference and workshop papers (peer-reviewed)

- **R. Creswell,** M. K. Gibson, T. E. Gibson, J. W. Leff, and G. K. Gerber: "A multi-level Bayesian nonparametric model of longitudinal responses of the human microbiota to dietary interventions," *ICML and IJCAI Workshop on Computational Biology*, Stockholm, Sweden (2018).

Preprints

- **R. Creswell,** B. Lambert, C. L. Lei, M. Robinson, and D. Gavaghan: "Using flexible noise models to avoid noise model misspecification in inference of differential equation time series models," arXiv:1410.5093 (2020).

Talks

- Inference for Expensive Systems in Mathematical Biology, Oxford, England (2022).
- Microbiome Mini-Symposium (on the event of the visit of the Wageningen University Microbiology Laboratory to Harvard Medical School), Boston, Massachusetts (2019).
- Forum for Advanced Biomedical Computation, Boston, Massachusetts (2018).
- MIT-Harvard Microbiome Symposium, Cambridge, Massachusetts (2018).

Poster presentations

- The Royal Society, Modelling the Covid-19 Pandemic: Achievements and Lessons, London, England (2022).
- Brigham & Women's Hospital Pathology Research Celebration, Boston, USA (2019).
- MIT-Harvard Microbiome Symposium, Cambridge, USA (2019).
- ICML and IJCAI Workshop on Computational Biology, Stockholm, Sweden (2018).
- Harvard Medical School Pathology Research Retreat, Boston, USA (2018).
- MIT-Harvard Microbiome Symposium, Cambridge, USA (2018).
- Computational Aspects of Biological Information, Microsoft Research New England, Cambridge, USA (2018).