Robert J. Noble

robjohnnoble.github.io
scholar.google.com/citations?user=lDDprHkAAAAJ

Research focus: Mathematical and computational modelling of cancer evolution and treatment.

Academic employment

2020- Department of Mathematics, City, University of London
Senior Lecturer in Applied Mathematics (August 2024-)
Lecturer in Applied Mathematics (July 2020-July 2024)

2018-2020 Department of Evolutionary Biology and Environmental Studies, University of Zurich
Postdoctoral researcher (20% contract) advised by Hanna Kokko

2017-2020 Department of Biosystems Science and Engineering, ETH Zurich
Postdoctoral researcher (80% contract from May 2018) advised by Niko Beerenwinkel

2014-2017 Institut des Sciences de l'Evolution de Montpellier (ISEM)
Postdoctoral researcher advised by Michael Hochberg

Education and qualifications

2024 Advance HE Fellowship

2009-2014 DPhil in Zoology (mathematical biology), University of Oxford
Supervisors: Mario Recker and Sunetra Gupta

1999-2003 Master of Mathematics (First Class), University of York

Publications and preprints (* denotes equal contributions)

2024	*A seven-step guide to spatial, agent-based modelling of tumour evolution* Colyer B, Bak M, Basanta D, **Noble R**	Evol. Appl. eva.13687
2023	*Selective sweep probabilities in spatially expanding populations* Stein A, Kizhuttil R, Bak M, **Noble RJ**	bioRxiv 2023.11.27.568915
2023	*Preventing evolutionary rescue in cancer* Patil S, Viossat Y, **Noble R**	bioRxiv 2023.11.22.568336
2023	*A new universal system of tree shape indices* **Noble R**, Verity K	bioRxiv 2023.07.17.549219
2023	*Warlock: an automated computational workflow for simulating spatially structured tumour evolution* Bak M, Colyer B, Manojlović V, **Noble R**	arXiv 2301.07808
2023	*A survey of open questions in adaptive therapy: bridging mathematics and clinical translation* West J, Adler F, Gallaher J, …, **Noble R**, Viossat Y, Basanta D, Anderson ARA	eLife 12:e84263
2022	*Robust, universal tree balance indices* Lemant J, Le Sueur C, Manojlović V, **Noble RJ**	Syst. Biol. 71, 1210-24
2021	*Spatial structure governs the mode of tumour evolution* **Noble R**, Burri D, Le Sueur C, Lemant J, Viossat Y, Kather JN, Beerenwinkel N	Nature Ecol. Evol. 6, 207-17
2021	*Drug-induced resistance evolution necessitates less aggressive treatment* Kuosmanen T, Cairns J, **Noble R**, Beerenwinkel N, Mononen T, Mustonen V	PLoS Comput. Biol. 17: e1009418
2021	*Inferring the dynamic of mutated hematopoietic stem and progenitor cells induced by IFNα in myeloproliferative neoplasms* Mosca M*, Hermange G*, Tisserand A*, **Noble R***, …, Plo I	Blood 138, 2231-43
2021	*Paracrine behaviors arbitrate parasite-like interactions between tumor subclones* **Noble R**, Walther V, Roumestand C, Hochberg ME, Hibner U, Lassus P	Front. Ecol. Evol. 9:675638
2021	*A theoretical analysis of tumour containment* Viossat Y, **Noble R**	Nature Ecol. Evol. 5, 826-35

2020	*Identifying key questions in the ecology and evolution of cancer* Dujon A, …, **Noble R**, …, Thomas F, Ujvari B	Evol. Appl. eva.13190
2020	*When, why and how tumour clonal diversity predicts survival* **Noble R***, Burley JT*, Le Sueur C, Hochberg ME	Evol. Appl. eva.13057
2017	*Spatial competition constrains resistance to targeted cancer therapy* Bacevic K*, **Noble R***, …, Hochberg ME, Krasinska L, Fisher D	Nature Commun. 8, 1995
2017	*Antibiotic stress selects against cooperation in the pathogenic bacterium* Pseudomonas aeruginosa Vasse M*, **Noble R***, …, Hochberg ME	PNAS 114, 546-51
2017	*A framework for how environment contributes to cancer risk* Hochberg ME, **Noble R**	Ecol. Lett. 20, 117-34
2016	*Overestimating the role of environment in cancers* **Noble R**, Kaltz O, Nunney L, Hochberg ME	Cancer Prev. Res. 9, 773-6
2016	*A hypothesis to explain cancers in confined colonies of naked mole rats* Hochberg ME, **Noble RJ**, Braude S	bioRxiv 10.1101/079012
2015	*Peto's paradox and human cancers* **Noble R**, Kaltz O, Hochberg ME	Phil. Trans. B 370, 20150104
2013	*The antigenic switching network of* Plasmodium falciparum *and its implications for the immuno-epidemiology of malaria* **Noble R***, Christodoulou Z*, Pinches R, Kyes S, Recker M, Newbold CI	eLife 2013.2:e01074
2012	*Erasing the epigenetic memory and beginning to switch—the onset of antigenic switching of* var *genes in* Plasmodium falciparum Fastman Y, **Noble R**, Recker M, Dzikowski R	PLoS ONE 7, e34168
2012	*A statistically rigorous method for determining antigenic switching networks* **Noble R**, Recker M	PLoS ONE 7, e39335

Software

2022	*warlock: Automated computational workflow for simulating tumour evolution*	GitHub
2019	*demon: Deme-based oncology model*	GitHub
2017	*ggmuller: Create Muller plots of evolutionary dynamics*	CRAN

Teaching

2020- **Supervision (City, University of London)**
PhD primary supervisor: Kate Bostock (2024-); Alex Chitiga (2024-); Kimberley Verity (2022-); Blair Colyer (2021-); Veselin Manojlović (2020-24)
PhD secondary supervisor: Manjot Singh Bedi (2023-); Youssef Arafat (2021-); Hasan Haq (2021-)
Final year IISER BS-MS thesis: Srishti Patil (2022-23)
Postdoctoral research supervisor: Maciej Bak (2022)
Lecturing and tutoring as module leader (City, University of London)
Mathematical processes for finance (BSc); Mathematics for economists post A Level (BSc)
Tutoring (City, University of London)
Algebra (BSc); Functions, vectors and calculus (BSc); Final-year group projects (BSc)

2017-2020 **Supervision (ETH Zurich)**
Second year MSc thesis: Alexander Stein; Jeanne Lemant; Dominik Burri
Research internship (eight months): Cécile Le Sueur
Lecturing and tutoring (ETH Zurich)
Evolutionary dynamics (MSc three terms)

2016 **Supervision (ISEM)**
First year MEME MSc project: John Burley

2010-2013 **Tutoring (University of Oxford)**
Quantitative methods (BSc)
Demonstrating (University of Oxford)
Quantitative methods (BSc); Epidemiology (BSc); Epidemiological models (MSc)

Funding and awards

Co-awardee of US NSF grant *Quantifying and modeling the transmission dynamics of bivalve transmissible neoplasia* (PhD student and travel support in 2023-27)

Sub-awardee of US NCI Arizona Cancer Evolution Center U54 grant (£110K in 2020-2023)

Awardee of LMS Research in Pairs grant (£850 in 2024-2026)

Awardee of ACE Pilot Project funding (£6K in 2022)

Awardee of City University Pump Priming funding (£10K in 2022)

Co-awardee of FMJH grant *Optimization of a new type of cancer therapy* (£4K in 2019-2020)

Biotechnology and Biological Sciences Research Council PhD fellowship 2009-2013

Travel grants: Lorentz Center 2017; Moffitt Cancer Center 2015; ECMTB 2011

City University Images of Research Competition 2020-21: First prize (£250)

External professional activities

Secretary (elected) of the International Society for Evolution, Ecology and Cancer 2022-2025; Advisory Committee member (elected) 2018-2021

Supervisory Board member of the EvoGamesPlus Innovative Training Network 2021-2025

PhD external examiner: Queen Mary University of London (2022), Institute of Cancer Research (2021)

Associate Editor of Journal of Molecular Evolution; Guest Associate Editor of PLoS Computational Biology; Editorial Board Member of Scientific Reports

Reviewer: American Naturalist, Cancer Cell International, Cancer Research, Computational and Systems Oncology, eLife, Evolution, Evolutionary Applications, F1000Research, Frontiers Ecology and Evolution, Journal of Evolutionary Biology, Journal of Theoretical Biology, Nature Communications, Nature Ecology & Evolution, Nature Genetics, Nature Reviews Bioengineering, npj Genomic Medicine, Peer Community in Evolutionary Biology, PLoS Computational Biology, PNAS, Proceedings of the Royal Society B, Royal Society Open Science, Scientific Reports

Co-organizer: “Evolutionary approaches to understand cancer across scales" symposium (SMBE 2023); “Cancer Adaptive Therapy Models” workshop (2020); “Aging & cancer through the lens of evolution” symposium (ESEB 2019); “How does spatial structure affect tumour evolution?” symposium (MBE 2017)

Other employment

2008-2009 International HIV/AIDS Alliance: Communications

2004-2008 AVERT (HIV/AIDS charity): Science and health communication

Invited departmental seminars

Feb 2024 *New directions in mathematical oncology*
Queen Mary University of London (hosted by Weini Huang)

Apr 2023 *Quantifying and explaining modes of evolution*
University of Leeds (hosted by Tyler Cassidy)

Feb 2022 *Explaining the modes of tumour evolution*
University of Warwick (virtual, hosted by Simon Graham)

Oct 2021 *Explaining the modes of tumour evolution*
University of Basel (virtual, hosted by Dominik Burri)

Sept 2020 *Characterizing and forecasting tumour evolution*
Cancer Research UK Cambridge Institute (virtual, hosted by Florian Markowetz)

Jun 2020 *Characterizing and forecasting tumour evolution*
Virtual Seminar on Modeling Biocomplexity (hosted by Andreas Deutsch)

May 2020 *Characterizing and forecasting tumour evolution*
Moffitt Cancer Center (virtual, hosted by David Basanta)

Jan 2020 *Cancer: evolution, ecology and bad luck*
University of Bath (hosted by Ben Ashby)

Dec 2019 *The logic of containing tumours*
University of Oxford (hosted by Eamonn Gaffney)

Sep 2019 *Cancer: evolution, ecology and bad luck*
University of Southampton (hosted by Lindy Holden-Dye)

Feb 2019 *Characterising the evolutionary modes of cancer and normal tissue*
TU Dresden (hosted by Andreas Deutsch)

Mar 2018 *Characterising the evolutionary modes of cancer and normal tissue*
University of Basel (hosted by Richard Neher)

Feb 2018 *The mode and predictability of intra-tumour evolution*
Wellcome Sanger Institute (hosted by Iñigo Martincorena)

Dec 2017 *The mode and predictability of intra-tumour evolution*
Boston University (hosted by Kirill Korolev)

Nov 2017 *Spatial constraints on intratumour evolution*
Harvard University (hosted by Martin Novak)

May 2017 *Models for understanding tumour evolution and improving cancer therapy*
University of Edinburgh (hosted by Bartlomiej Waclaw)

Mar 2017 *Evolution, ecology, and cancer risk: from naked mole rats to modern humans*
Chalmers University (hosted by Philip Gerlee)

Sep 2016 *Cancer: evolution, ecology and bad luck*
Harvard University (hosted by Martin Novak)

Feb 2015 *Data-based modelling of tumour evolution*
Moffitt Cancer Center (hosted by Robert Gatenby)

Conference talks

May 2023 *Tumour heterogeneity and survival of cancer patients*
Invited talk at French Cancer Society training session on tumour heterogeneity, Paris

Mar 2023 *Evolutionary approaches to overcoming cancer cell plasticity*
Invited talk at the Systems Approaches Towards Cancer Cell Plasticity Symposium, London

Sep 2022 *Robust, universal tree balance indices*
European Conference on Mathematical and Theoretical Biology, Heidelberg

Jul 2022 *Parasite-like interactions between tumour subclones*
Mathematical Models in Ecology and Evolution, Reading

Jul 2021 *The evolutionary logic of tumour containment*
International Society for Evolution, Medicine & Public Health conference (virtual)

Jun 2021 *The evolutionary logic of tumour containment*
Evolution conference (virtual)

Jun 2021 *Explaining modes of tumour evolution*
Society for Mathematical Biology conference (virtual)

Dec 2020 *The logic of containing tumours*
Cancer Adaptive Therapy Models workshop (virtual)

Oct 2020 *Characterizing and forecasting tumour evolution*
International Symposium on Mathematical and Computational Oncology (virtual)

Aug 2020 *The logic of containing tumours*
Invited talk at the Society for Mathematical Biology conference (virtual)

Aug 2019 *Spatial competition constrains resistance to targeted cancer therapy*
International Society for Evolution, Medicine & Public Health conference, Zurich

Jul 2019 *Spatial structure governs the mode of tumour evolution*
Intelligent Systems for Molecular Biology / European Conference on Comp. Biology, Basel

Jun 2019 *Spatial structure governs the mode of tumour evolution*
Modelling Ecology & Evolution Zurich seminar, Zurich

Sep 2018 *Characterising the evolutionary modes of cancer and normal tissue*
Evolutionary Models of Structured Populations workshop, Plön

Dec 2017 *Spatial competition constrains resistance to targeted cancer therapy*
International Society for Evolution, Ecology and Cancer Conference, Tempe

Oct 2017 *Impact of tissue architecture on the nature and predictability of tumour evolution*
Satellite Symposium to the Louis-Jeantet Symposium, Geneva

Sep 2017 *Impact of tissue architecture on the nature and predictability of tumour evolution*
Basel Computational Biology Conference, Basel

Jul 2017 *Impact of tissue architecture on the nature and predictability of tumour evolution*
Intelligent Systems for Molecular Biology / European Conference on Comp. Biology, Prague

Apr 2017 *Evolutionary ecology of senescence and cancer risk: from naked mole rats to modern humans*
Modelling Biological Evolution conference, Leicester

Nov 2016 *Controlling drug resistance with adaptive therapy*
Invited talk at the second Modeling Tumour Evolution conference, Bielefeld

Sep 2016 *Cancer: evolution, ecology and bad luck*
Invited talk at the first Modelling Tumour Evolution conference, Bielefeld

Jul 2016 *Cancer risk: evolution, ecology and bad luck*
Joint Meeting of ESMTB & Society for Mathematical Biology, Nottingham

Dec 2015 *Peto's paradox and human cancers*
Third International Biannual Evolution and Cancer Conference, San Francisco

Sep 2015 *Modelling ecological interactions of cancer clones*
Cancer Evolution Through Space and Time workshop, Plön

Apr 2015 *Eco-evolutionary models of tumour heterogeneity*
Invited talk at the Modelling Biological Evolution conference, Leicester

June 2011 *Using iterative methods to determine an antigenic switching network in* Plasmodium falciparum
European Conference on Mathematical and Theoretical Biology, Krakow

May 2011 *Determining the switch pathway of the* var *gene repertoire of* Plasmodium falciparum
Biology and Pathology of the Malaria Parasite, Heidelberg