

# Robert J. Noble

[robjohnnoble.github.io](https://robjohnnoble.github.io)  
[scholar.google.com/citations?user=IDDprHkAAAAJ](https://scholar.google.com/citations?user=IDDprHkAAAAJ)

**Research focus:** Mathematical and computational modelling of cancer evolution and ecology.

## Academic employment

- 2020- Department of Mathematics, City, University of London  
Lecturer in Applied Mathematics
- 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

- 2009-2014 DPhil, Mathematical biology, University of Oxford  
Supervisors: Mario Recker and Sunetra Gupta
- 1999-2003 Master of Mathematics (First Class), University of York

## Publications

\* denotes equal contributions

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|------|---|---------------------------------|
| 2022 | <i>Robust, Universal Tree Balance Indices</i><br>Lemant J, Le Sueur C, Manojlović V, <b>Noble RJ</b>  | Syst. Biol.<br>syac027          |
| 2021 | <i>Spatial structure governs the mode of tumour evolution</i><br><b>Noble R</b> , Burri D, Le Sueur C, Lemant J, Viossat Y, Kather JN, Beerenwinkel N   | Nature Ecol. Evol.<br>6, 207-17 |
| 2021 | <i>Drug-induced resistance evolution necessitates less aggressive treatment</i><br>Kuosmanen T, Cairns J, <b>Noble R</b> , Beerenwinkel N, Mononen T, Mustonen V  | PLoS Comput. Biol. 17: e1009418 |
| 2021 | <i>Inferring the dynamic of mutated hematopoietic stem and progenitor cells induced by IFN<math>\alpha</math> in myeloproliferative neoplasms</i><br>Mosca M*, Hermange G*, Tisserand A*, <b>Noble R*</b> , ..., Plo I                        | Blood<br>blood.2021010986       |
| 2021 | <i>Paracrine behaviors arbitrate parasite-like interactions between tumor subclones</i><br><b>Noble R</b> , Walther V, Roumestand C, Hochberg ME, Hibner U, Lassus P  | Front. Ecol. Evol.<br>9:675638  |
| 2021 | <i>A theoretical analysis of tumour containment</i><br>Viossat Y, <b>Noble R</b>  | Nature Ecol. Evol.<br>5, 826-35 |
| 2020 | <i>Identifying key questions in the ecology and evolution of cancer</i><br>Dujon A, ..., <b>Noble R</b> , ..., Thomas F, Ujvari B   | Evol. Appl.<br>eva.13190        |
| 2020 | <i>When, why and how clonal diversity predicts survival</i><br><b>Noble R*</b> , Burley JT*, Le Sueur C, Hochberg ME  | Evol. Appl.<br>eva.13057        |
| 2017 | <i>Spatial competition constrains resistance to targeted cancer therapy</i><br>Bacevic K*, <b>Noble R*</b> , Soffar A, Ammar OW, Boszonyik B, Prieto S, Vincent C, Hochberg ME, Krasinska L, Fisher D   | Nature Commun.<br>8, 1995       |
| 2017 | <i>Antibiotic stress selects against cooperation in the pathogenic bacterium <i>Pseudomonas aeruginosa</i></i><br>Vasse M*, <b>Noble R*</b> , Akhmetzhanov AR, Torres-Barceló C, Gurney J, Benateau S, Gougat-Barbera C, Kaltz O, Hochberg ME | PNAS<br>114, 546-51             |
| 2017 | <i>A framework for how environment contributes to cancer risk</i><br>Hochberg ME, <b>Noble R</b>  | Ecol. Lett.<br>20, 117-34       |

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|------|--|---------------------------------|
| 2016 | <i>Overestimating the role of environment in cancers</i><br><b>Noble R</b> , Kaltz O, Nunney L, Hochberg ME  | Cancer Prev. Res.<br>9, 773-6   |
| 2015 | <i>Peto's paradox and human cancers</i><br><b>Noble R</b> , Kaltz O, Hochberg ME   | Phil. Trans. B<br>370, 20150104 |
| 2013 | <i>The antigenic switching network of Plasmodium falciparum and its implications for the immuno-epidemiology of malaria</i><br><b>Noble R*</b> , Christodoulou Z*, Pinches R, Kyes S, Recker M, Newbold CI | eLife<br>2013.2:e01074          |
| 2012 | <i>Erasing the Epigenetic Memory and Beginning to Switch—The Onset of Antigenic Switching of var Genes in Plasmodium falciparum</i><br>Fastman Y, <b>Noble R</b> , Recker M, Dzikowski R                   | PLoS ONE<br>7, e34168           |
| 2012 | <i>A statistically rigorous method for determining antigenic switching networks</i><br><b>Noble R</b> , Recker M   | PLoS ONE<br>7, e39335           |

### Software

|      |   |        |
|------|---|--------|
| 2017 | <i>ggmuller: Create Muller Plots of Evolutionary Dynamics</i> | CRAN   |
| 2019 | <i>demon: Deme-based oncology model</i>                       | GitHub |

### Teaching

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| 2020-         | <b>Supervision (City, University of London)</b><br>PhD primary supervisor, Veselin Manojlović<br>PhD primary supervisor, Blair Colyer<br>PhD secondary supervisor, Youssef Arafat<br>PhD secondary supervisor, Hasan Haq<br><b>Lecturing and tutoring as module leader (City, University of London)</b><br>Mathematical processes for finance (BSc)<br>Mathematics for Economists Post A Level (BSc)<br><b>Tutoring (City, University of London)</b><br>Algebra (BSc); Functions, Vectors and Calculus (BSc) |  |
| 2017-<br>2020 | <b>Supervision (ETH Zurich)</b><br>Second year MSc thesis, Alexander Stein (next step: PhD at QMUL)<br>Second year MSc thesis, Jeanne Lemant (next step: PhD at University of Basel)<br>Second year MSc thesis, Dominik Burri (next step: PhD at University of Basel)<br>Research internship (eight months), Cécile Le Sueur (next step: PhD at EMBL)<br><b>Lecturing and tutoring assistance (ETH Zurich)</b><br>Evolutionary dynamics (MSc three terms)  |  |
| 2016          | <b>Supervision (ISEM)</b><br>First year MEME MSc project, John Burley (next step: PhD at Brown University)   |  |
| 2010-<br>2013 | <b>Tutoring (University of Oxford)</b><br>Quantitative Methods (BSc two terms)<br><b>Demonstrating (University of Oxford)</b><br>Quantitative Methods (BSc; three terms); Epidemiology (BSc; two terms); Epidemiological Models (MSc one term)   |  |

### Funding and awards

\$150K personal funding for 2020-2022 from the NCI, via the Arizona Cancer Evolution Center (ACE)  
 Awardee of ACE Pilot Project funding (\$8K in 2022)  
 Co-awardee of FMJH grant *Optimization of a new type of cancer therapy* (€5K 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)

## Professional activities

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

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

Guest Associate Editor: PLoS Computational Biology

Reviewer: American Naturalist, Cancer Research, Evolutionary Applications, F1000Research, Frontiers Ecology and Evolution, Journal of Evolutionary Biology, Journal of Theoretical Biology, Nature Communications, Nature Ecology & Evolution, Nature Genetics, npj Genomic Medicine, PLoS Computational Biology, PNAS, Proceedings of the Royal Society B, Royal Society Open Science, Scientific Reports

Co-organizer: “Cancer Adaptive Therapy Models” workshop (2020); “Aging & cancer through the lens of evolution” symposium (ESEB conference 2019); “How does spatial structure affect tumour evolution?” symposium (MBE conference 2017)

## Other employment

2008-2009 International HIV/AIDS Alliance: Communications

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

## Invited departmental seminars

- 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 Bartłomiej 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**

- 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