Rowan Barker-Clarke, Ph.D. (he/him)

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rbarkerclarke http://rbarkerclarke.github.io/

Education

2015 – 2020 **Ph.D., University of Cambridge, UK** in Medical Science.
Thesis title: *Analysing the relationship between immune infiltration and tissue architecture in high-grade serous ovarian cancer.*
Advisor: *Prof. James Brenton*

2011 – 2015 **M.Phys., University of Oxford, UK** in Physics *(3 + 1 years)*
Specializations: *Biological Physics, Quantum Information Processing*
Thesis title: *GPU accelerated enumeration and exploration of HP model genotype-phenotype maps for protein folding.*
Advisor: *Prof. Ard Louis*

Interests

Clinical Measures of Evolution · Cancer Patient Digital Twins · Wearable Devices · Digital Biomarkers

Research and Clinical Experience

2024-current· · · **Co-Investigator,** *Glioblastoma Remote Monitoring and Care*. Case Comprehensive Cancer Center, Cleveland, OH. **NCT06129760**. https://classic.clinicaltrials.gov/ct2/show/NCT06129760

2023-current· · · **Postdoctoral Research Fellow,** Theory Division
Taussig Cancer Center, Cleveland Clinic, Cleveland, OH.
Topics: *Measuring Clinical Evolution to Build Digital Twin Models*
Advisor(s): *Prof. Jacob Scott, Prof. Andrew Dhawan*

2021-2023 **Postdoctoral Research Fellow,** Theory Division
Taussig Cancer Center, Cleveland Clinic, Cleveland, OH.
Topics: *Evolutionary Game Theory in Oncology*
Advisor(s): *Prof. Jacob Scott, Prof. Mike Hinczewski*

2014 **Summer Research Studentship,** Department of Planetary Physics,
University of Oxford, Oxford, United Kingdom
Project: *Analysis of Neptune's Cloud Structure*
Advisor: *Prof. Patrick Irwin*

2013 **Summer Research Studentship,** Department of Biophysics,
University of Oxford, Oxford, United Kingdom
Project: *Holographic Microscopy for 3D Particle Tracking*
Advisor: *Prof. Richard Berry*

Research Publications

Journal Articles

1. **R. Barker-Clarke**, D. Weaver, and J. G. Scott, "Graph 'texture' features as novel metrics that can summarize complex biological graphs," *Physics in Medicine and Biology*, 2023.

2. E. Somasundaram, R. R. Wadhwa, A. Litzler, **R. Barker-Clarke**, *et al.*, "Clinical Nomogram Using Novel Computed Tomography–Based Radiomics Predicts Survival in Patients With Non–Small-Cell Lung Cancer Treated With Stereotactic Body Radiation Therapy," *JCO Clinical Cancer Informatics*, vol. 7, e2200173, 2023.

3. E. Somasundaram, A. Litzler, R. Wadhwa, **R. Barker-Clarke**, and J. Scott, "Persistent homology of tumor CT scans is associated with survival in lung cancer," *Medical Physics*, vol. 48, no. 11, pp. 7043–7051, 2021.
4. A. Montfort†, **R. Barker-Clarke**†, A. M. Piskorz, *et al.*, "Combining measures of immune infiltration shows additive effect on survival prediction in high-grade serous ovarian carcinoma," *British Journal of Cancer*, vol. 122, no. 12, pp. 1803–1810, 2020, †These authors contributed equally.
5. P. Irwin, L. N. Fletcher, D. Tice, **R. Barker-Clarke**, *et al.*, "Time variability of neptune's horizontal and vertical cloud structure revealed by vlt/sinfoni and gemini/nifs from 2009 to 2013," *Icarus*, vol. 271, pp. 418–437, 2016.

Preprints

1. **R. Barker-Clarke**, J. M. Gray, D. Tadele, M. Hinczewski, and J. G. Scott, *Masking, maintenance and mimicry: The interplay of cell-intrinsic and cell-extrinsic effects in evolutionary games*, 2023. DOI: 10.1101/2023.03.15.532871. eprint: bioRxiv.org.
2. E. S. King, J. Pelesko, J. Maltas, **R. Barker-Clarke**, E. Dolson, and J. G. Scott, *Fitness seascapes facilitate the prediction of therapy resistance under time-varying selection*, 2022. DOI: 10.1101/2022.06.10.495696. eprint: bioRxiv.org.

Books and Chapters

1. **R. Barker-Clarke**, E. S. King, J. Maltas, J. A. Agren, D. Tadele, and J. G. Scott, *Decoding Cancer Evolution through Adaptive Fitness Landscapes (in Cancer Systems Biology and Translational Mathematical Oncology)*, Oxford University Press (accepted), 2023.

Software

gtexture Generalized Application of Co-Occurrence Matrices and Haralick Texture. CRAN. https://cran.r-project.org/web/packages/gtexture/index.html

Grants and Awards

Grants and Fellowships

2014-15 **Summer Research Fellowship.** Department of Planetary Science. University of Oxford. Oxford, UK.

2021-23 **Velosano Pilot Grant.** Key Personnel. Cleveland Clinic, Cleveland, OH.
Project: Eco-evolutionary dynamics of lung cancer.

Awards

2015 **Project award.** Most innovative MPhys Project. ($100)
Department of Physics, University of Oxford, Oxford.
Project: Genotype-phenotype space of HP protein folding models.

Project award. Best overall MPhys Project. ($250)
Department of Physics, University of Oxford, Oxford.
Project: Genotype-phenotype space of HP protein folding models.

2022 **Travel award.** Biology and Medicine in Mathematics! 22. Richmond, VA.

Travel award. Integrated Mathematical Oncology Workshop X. Moffitt Cancer Center. Tampa, FL.

2023 **LRI Alumni Association Travel Award.** MathOnco23. Phoenix, AZ.

Presentations

Invited Talks and Seminars

2021 **Invited Talk**. Society of Mathematical Biology. *(Online).*
Title: Evolutionary Control on Game Landscapes

2022 **Invited Talk**. Special Session: Mathematics of DNA and RNA, Joint Mathematics Meeting (JMM). *(Online).*

2023 **Invited Talk**. Special Session: Mathematics of DNA and RNA, JMM. Boston, MA, USA.

Department Seminar. Mathematics, Cleveland State University, Cleveland, OH, USA.
Title: Solving partial-differential equations for eco-evolutionary cancer models

2024 **Invited Talk**. Special Session: Mathematics of DNA and RNA, JMM. San Francisco, CA, USA.
Title: Graph-based models of cancer evolution.

Invited Talk. Emerging Researchers in Mathematical Oncology: The MathOnco Subgroup Minisymposium. Society of Mathematical Biology. Seoul. Korea. (June)
Title: Wearable Device Data as Digital Biomarkers in Cancer Patient Digital Twin Models

Contributed Talks

2021 **ISCMO'21.** International Symposium on Mathematical and Computational Oncology.*(Online)*

2022 **AACR.** Evolutionary Dynamics in Carcinogenesis and Response to Therapy, Tampa, FL.

BAMM!22 Biology and Medicine in Mathematics 22. Virginia Commonwealth University, Richmond, VA

TMD22. Trans Math Day 22 *(Online).*
Title: Eco-evolutionary effects in population dynamic models.

2023 **MathOnc2023**. Mathematical Oncology Meeting. Mayo Clinic, Phoenix, AZ.
Title: De

AACR Special Session: Translating Cancer Evolution and Data Science: The Next Frontier. Boston, MA. *Title: Topology of the tumor microenvironment: The integration of imaging, modeling, and topological data analysis.*

2024 **JMM** Special Session. Geometry and Topology of High-Dimensional Biomedical Data. San Francisco, CA, USA. *Title:Topological data analysis for highly multiplexed tissue imaging.*

JMM Contributed Paper Session on Algebraic Topology and Manifolds, II. San Francisco, CA, USA.*Title: Topology and folds of fully enumerated, small on-lattice HP protein model*

Poster Presentations

2019 **EACR**. Cancer Genomics 2019, Cambridge, UK.

2020 **AACR**. Annual Meeting '20 (Virtual). *(Online)*

2022 **BAMM!22**. Biology and Medicine in Mathematics. Virginia Commonwealth University, Richmond, VA. *CoOccurR.*

IMOX: Cancer Communities. Integrated Mathematical Oncology Workshop X. Moffitt Cancer Center. Tampa, FL.

2023 **Cleveland Clinic:** LRI Research Day, Cleveland, OH.

AACR: Translating Cancer Evolution and Data Science: The Next Frontier. Boston, MA.

Teaching

2023-current **Python Bootcamp.** Instruction and Course Design.
Research, Education and Training Center. Cleveland Clinic, Cleveland, OH.

2023- **Life of A Scientist Program.** Teaching Fellow.
Riseup: Northeast Ohio. Cleveland, OH.

Teaching (continued)

2018-2020 — **Introduction to R for Biologists.** Bioinformatics Training Centre. University of Cambridge, Cambridge, UK.

Introduction to Python for Biologists. Bioinformatics Training Centre. University of Cambridge, Cambridge, UK.

Guest Lecturer

Fall 2023 — **Sex and Gender in Biology.** Applied Mathematics. School of Natural Sciences. UC Merced, Merced, CA, USA.

Private tutor

2014–current — **Mathematics, Physics, Biology, and Chemistry.** (*In-person* and *Online*)
Examination levels: GCSE, A-level, International Baccalaureate, Advanced Placement.

Mentoring Experience

Graduate students

2023-current — **S. Patanavich**, School of Medicine. Case Western Reserve University, OH.
Project: Clinical trial design for remote monitoring in glioblastoma.

2022-current — **J.M. Gray**, Department of Physics. Case Western Reserve University, OH.
Project: Game interactions in spatial and range expansion tumor models.

2023-2024 — **N. Latina**, Department of Genetics. Case Western Reserve University, OH.
Project: Neural networks and data augmentation for human activity recognition.

2022-2024 — **M. Reinius, MD**, Cancer Institute, University of Cambridge, Cambridge, UK.
Project: Spatial metrics and topological data analysis for histopathology.

2022-2023 — **B. Feng**, School of Medicine. Case Western Reserve University, OH.
Project: Wearable device software for collecting remote monitoring data.

G. Clarke, Department of Neuroscience, Kings College London, London, UK.
Project: Computational models of mutant ARPP aggregation in neurons.

Undergraduate Students

2024-current — **A. Stacy**, Department of Physics. Case Western Reserve University, OH.
Project: Sensing resistance evolution in the morbidostat under different treatment regimens.

2022-2023 — **C. Nosrati**, Department of Mathematics. Case Western Reserve University, OH.
Project: Game Theory in Models of Population Genetics.

Highschool Students

2023-current — **J. Joyce**, Engineering and Data Science. Rising Junior. Cleveland, OH
Project: Sensing resistance evolution in the morbidostat under different treatment regimens.

2022 — **D. Suh**, Machine Learning and Data Science. Rising Senior, Cleveland, OH
Project: Machine learning for human activity recognition.

Administration and Service

2024-current — **Reviewer** PLOS Computational Biology, Cancer Medicine.

2023-current — **Conference Organizing Committee** Queer in Computational and Applied Mathematics (QCAM) (June 2024). ICERM, Providence, RI.

Scientific Officer "Life of a Scientist" program. Riseup: Northeast Ohio, Cleveland, OH.

Administration and Service (continued)

- **Public Opinion Leader** Community HIV Information and Prevention Program. LGBTQ+ Center of Greater Cleveland, Cleveland, OH.

2022-current
- **Co-Reviewer** PLOS Computational Biology, Communications Medicine, Cybernetics and Systems.

2024
- **Poster Judge** Annual Biomedical Conference for Minoritized Scientists (e-symposium), American Society of Microbiology, April 2024 (online).

2022
- **Poster Judge** NEOhio Science Fair , Cleveland, OH.

Professional Memberships

2023-
- **Society of Industrial and Applied Mathematics**
- **Society of Mathematical Biology**

2022-
- **American Mathematical Society**

2021-
- **American Association for Cancer Research**

2018-
- **European Association for Cancer Research**

2018-2020
- **British Association of Cancer Research**

Skills

Techniques
- Image Analysis, Radiomics, Machine Learning, Deep Neural Networks, Topological Data Analysis, Feature Engineering, Time Series Forecasting

Programming
- R, Python, C++, CUDA, Julia, LaTeX, HTML, CSS

Software + Packages
- QuPath, Halo

References

Prof Jacob Scott
Case Western Reserve University,
Cleveland, OH.
scottj10@ccf.org

Prof James Brenton
University of Cambridge,
Cambridge, UK.
james.brenton@cruk.cam.ac.uk