

# Finlay Maguire | Curriculum Vitae

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## Education

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### Doctor of Philosophy

*Bioinformatics*

**University College London**

*October 2011 - July 2016*

Title: A Multi-omic Analysis of the Photosynthetic Endosymbioses of *Paramecium bursaria*

Supervisor: Thomas A. Richards

A reconstruction of cellular interactions in a nascent endosymbiotic system through novel application of machine learning and computational methods to analyse 'single' cell metagenomic, metabolomic, and metatranscriptomic datasets. It involved the first use of these datasets in the study of non-model multi-eukaryote systems.

### Master of Arts

*Natural Sciences - Biological Sciences, Honours*

**University of Oxford**

*October 2008–June 2011*

Title: The Evolution of the Folate Biosynthesis Gene Fusions in the Eukaryotes.

Supervisor: Thomas A. Richards

Conducted an independent bioinformatics honours research project to polarise deep-branching relationships within the evolutionary tree of life.

## Research Grants

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### NVIDIA Accelerated Data Science GPU Grant

*PI (equivalent: \$4,000)*

**Dalhousie University**

*September 2019*

### SSHRC Explore Grant

*Co-PI (\$4,950)*

**Dalhousie University**

*June 2019–May 2020*

### Donald Hill Family Postdoctoral Fellowship

*Fellowship (\$165,000)*

**Dalhousie University**

*April 2019–April 2022*

### NASA Planetary Biology Program

*10-Week Research Fellowship (£3500)*

**John F. Kennedy Space Center**

*July–October 2013*

### 4-Year Joint Institution PhD Studentship

*UCL-NHM PhD Studentship (£70,000)*

**University College London**

*October 2011–December 2016*

### Society for General Microbiology Harry Smith Studentship

*8-Week Research Scholarship (£1890)*

**University of Exeter**

*June–August 2010*

## Honours and Awards

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### Canadian Institutes of Health Research

*Hacking AMR 2019 Award (\$3000)*

*November 2018*

### American Society of Microbiology

*Travel Award (\$600)*

**Washington, DC**

*September 2018*

### Canadian Society of Microbiology

*Travel Award (\$500)*

**University of Manitoba**

*June 2018*

### Dalhousie Computer Science In-House Conference

*Best Presentation (\$50)*

**Dalhousie University**

*January 2018*

### School of Informatics Jamboree

*Poster Prize (£50)*

**University of Edinburgh**

*March 2015*

**National Data Science Bowl**

Top ~5% (57/1049)

**American Epilepsy Society Seizure Prediction Challenge**

Top 5% (16/527)

**FEMS Young Scientist Grant**

Meeting Scholarship (£350)

**Earth and Space Foundation**

Research Scholarship (£300)

**FEMS Young Scientist Grant**

Meeting Scholarship (£350)

**Society for General Microbiology Undergraduate Grant**

Travel Award (£170)

**Dukinfield Exhibition in Biological Sciences**

Scholarship for Academic Excellence (£300)

**Neuroglycerin**

December 2014–March 2015

**Neuroglycerin**

August–October 2014

**Sant Feliu du Guixols, Spain**

October 2013

**John F. Kennedy Space Center**

July–October 2013

**Sant Feliu du Guixols, Spain**

October 2011

**University of York**

September 2011

**University of Oxford**

October 2009–July 2011

## Experience

### Research Experience

**Donald Hill Family Fellow**

Faculty of Computer Science

Independent fellowship to fund use of technological approaches to attempt to create socially beneficial outcomes. This encompasses the continued development of previous work on antimicrobial resistance and machine learning based public health research. Additionally, it involves applying data science skills in collaboration with non-profits to help explore and solve existing difficulties encountered in the work of these organisations.

**Dalhousie University**

April 2019–Present

**Postdoctoral Fellow**

Faculty of Computer Science

Supervisor: Robert G. Beiko

Leading the development of the AMRtime project, a machine learning based antimicrobial resistance prediction tool for metagenomic datasets. Responsibilities include co-ordination of a project involving 3 universities and several national public health and agrifood stakeholders.

**Dalhousie University**

February 2017–March 2019

**Associate Research Fellow**

Living Systems Institute

Supervisor: Thomas A. Richards

Projects performed included experimental induction of RNAi in *P. bursaria*, automation of genome assembly using Bayesian optimisation, and analysis of protein transmembrane domain evolution with deep recurrent neural networks.

**University of Exeter**

October 2016–January 2017

**Competitive Machine Learning Team**

Neuroglycerin

- National Data Science Bowl II: estimation of cardiac ventricular volume from MRI videos and deep recurrent neural networks.
- National Data Science Bowl: image classification of plankton via model averaging of several deep convolutional neural networks. These networks used hierarchical labels, online image augmentation, and conventional visual feature extraction.
- American Epilepsy Society Seizure Prediction Challenge: classification of pre-seizure iEEGs from normal brain activity using an ensemble of random forest models trained on a range of signal analysis features.

**University of Edinburgh**

August 2014–March 2016

**NASA Researcher**

Exposing Microbes in the Stratosphere Project

Supervisor: David J. Smith

Performed ground-based trials for investigating the transcriptomic response to high UV-C flux exposure in *Bacillus*. Assisted with the design and construction of an atmospheric microbe exposure and sampling apparatus for high-altitude weather balloons.

**John F. Kennedy Space Center**

July–October 2013

**BBC Scientific Consultant** **John F. Kennedy Space Center**  
*Cloud Lab Documentary* *October 2013*  
Acted as NASA representative and scientific advisor for the British Broadcasting Company documentary on atmospheric sciences. Developed microbial sampling and exposure protocols and briefed the cast and producers on the relevant microbiological background.

**Undergraduate Researcher** **University of Exeter**  
*SGM Harry Smith Studentship* *June–August 2010*  
Funded summer honours research project (9 weeks) on the evolution of folate biosynthesis gene fusions within the eukaryotes.

### Teaching Experience.....

**MicroResearch** **Dartmouth General Hospital**  
*Assistant Instructor* *September 2019*

**Introduction to Computational Biology and Bioinformatics (CSCI4180/6801)** **Dalhousie University**  
*Lecturer (20%)* *March 2019*

**Bioinformatics Algorithms (CSCI6802)** **Dalhousie University**  
*Guest Lecturer on Phylogenetic Statistics* *March 2018*

**Data Management (INFO6540)** **Dalhousie University**  
*Guest Lecturer on Statistical Data Formats* *February 2018*

**Adult Literacy Network** **North Memorial Library**  
*GED Tutor* *January 2018–Present*

**International Course on Antibiotics and Resistance** **Annecy, France**  
*Assistant Bioinformatics Tutor* *November 2017*

**Introduction to Python and Advanced Python** **University of Exeter**  
*Assistant Instructor* *January–March 2016*

**Machine Learning for the Life Sciences** **University of Exeter**  
*Lecturer* *June 2016*

**Bioinformatics for Genomics** **University of Exeter**  
*Assistant Instructor* *February 2015*

**Unix and Perl** **University of Exeter**  
*Assistant Instructor* *October 2014*

**Image Processing with Python** **University of Exeter**  
*Assistant Instructor* *September 2014*

**Software Carpentry Bootcamp** **University of Exeter**  
*Teaching Assistant* *November 2013*

### Supervision Experience.....

**Summer Research Supervisor** **Dalhousie University**  
*Faculty of Computer Science* *May–August 2019*  
Supervision of an undergraduate student performing phylogenetic analyses of putative AMR genes.

**Summer Research Supervisor** **Dalhousie University**  
*Faculty of Computer Science* *May–August 2019*  
Supervision of an undergraduate student recovering and analysis frailty-associated metagenome assembled genomes.

**Short Project Supervision** **Simon Fraser University**  
*Department of Molecular Biology and Biochemistry* *March–April 2019*  
Supervision of PhD student for short term collaboration project on *in silico* AMR PCR methods and critical assessment of metagenome assembled genome methods.

**Undergraduate Honours Supervisor** **Dalhousie University**  
*Department of Biology* *October 2018–April 2019*  
Supervision of an undergraduate honours student analysing patterns of AMR in a large set of metagenome assembled genomes.

**NSERC Summer Research Supervisor***Faculty of Computer Science*

Supervision of an NSERC Undergraduate Research Assistant in developing machine learning models for predicting rRNA gene related AMR resistance.

**Dalhousie University***July–August 2018***Machine Learning Consultancy***Team Coordinator*

Supervised 2 PhD students on an industry partnership consultancy applying machine learning to time-sheet programs.

**Dalhousie University***June–September 2018***Bioinformatics Consultancy***Team Coordinator*

Supervised 2 PhD students performing microbial genomic analyses for a clinical microbiome project.

**Dalhousie University***July–November 2017***Nuffield Foundation Supervisor***High School*

Co-supervision of a high school student from a deprived area doing research on the evolution of endosymbiotic algae.

**University of Exeter***January–March 2016***Undergraduate Honours Supervisor***Biosciences*Supervision of an honours project performing phylogenetic analysis of the components of the RNAi system of *Paramecium*.**University of Exeter***November–December 2014***Undergraduate Honours Supervisor***Microbiology*

Supervision of a visiting research student registered at the University of Oxford involving the bioinformatic analysis of horizontal gene transfers of arsenate resistance.

**Natural History Museum***June–October 2013***Professional Experience****Canadian Association of Postdoctoral Societies Annual Conference***Host*

Hosted and co-ordinated organisation for the annual CAPS meeting.

**Dalhousie University***3 November 2019***Collective Bargaining Team***Postdoctoral Union*

Representing the postdoctoral union in negotiation over a new collective bargaining agreement with the university.

**Dalhousie University***October 2018–March 2019***Reviewer***Pre-Publication Peer Review*

Performed reviews for: Current Biology, BMC Genomics, PLoS Computational Biology, GigaScience, Communications Biology, MSystems, and, Bioinformatics

**Current Biology***February 2014–Present***Publications****Published**

- Alcock, B., Raphenya, A., Lau, T., Tsang, K., Bouchard, M., Edalatmand, A., Huynh, W., Nguyen, A., Cheng, A., Liu, S., Min, S., Miroshnichenko, A., Tran, H., El Werfalli, R., Nasir, J., Oloni, M., Speicher, D., Florescu, A., Singh, B., Faltyn, M., Hernández-Koutoucheva, A., Sharma, A., Bordeleau, E., Pawlowski, A., Zubyk, H., Dooley, D., Griffiths, E., **Maguire, F.**, Winsor, G., Beiko, R., Brinkman, F., Hsiao, W., Van Domselaar, G., McArthur, A. *CARD 2020: Antibiotic Resistance Surveillance with the Comprehensive Antibiotic Resistance Database* Nucleic Acid Research (2019)
- **Maguire, F.**, Rehman, M.A., Carrillo, C., Diarra, M.S., Beiko, R.G., *Identification of primary AMR drivers in agricultural non-typhoidal Salmonella enterica serovars using machine learning.* mSystems (2019)
- Wideman, J.G., Monier, A., Rodriguez-Martinez, R., Leonard, G., Cook, E., Poirier, C., **Maguire, F.**, Milner, D., Moore, K., Santoro, A.E., Keeling, P.J., Worden A.Z., Richards, T.A. *Targeted single-cell sequencing of heterotrophic flagellates identifies novel mitochondrial genome diversity.* Nature Microbiology (2019)
- Chambouvet, A., Monier, A., del Campo, J., **Maguire, F.**, Itoiz, S., Edvarsen, B., Ekreim, W., Richards, T.A. *Cryptic intracellular infection of ecologically important diatom species by a distinct Opisthosporidia (Holomycota) lineage.* Current Biology (2019)
- Stairs, J., Bal, N., **Maguire, F.**, Scott, H. *A Resident-led Clinic that Promotes the Health of Refugee Women Through Advocacy and Partnership.* Canadian Medical Education Journal (2019)

- o Milner, D.S., Attah, V., Cook, E., **Maguire, F.**, Savory, F.R., Morrison, M., Müller, C.A., Foster, P.G., Talbot, N.J., Leonard, G., Richards, T.A. *Environment-dependent fitness gains can be driven by horizontal gene transfer of transporter-encoding genes*. Proceedings of the National Academy of Sciences 116, 12 (2019), 5613-5622
- o Matthews, T., Bristow, F., Griffiths, E., Petkau, A., Adam, J., Dooley, D., Kruczkiewicz, P., Curatcha, J., Cabral, J., Fornika, D., Winsor, G., Courtot, M., Bertelli, C., Roudgar, A., Fejaio, P., Mabon, P., Enns, E., Thiessen, J., Keddy, A.W.S., Isaac-Renton, J., Gardy, J., Tang, P., **The IRIDA consortium**, Carriço, J., Chindelevitch, L., Chauve, C., Graham, M., McArthur, A.G., Taboada, E., Beiko, R.G., Brinkman, F.S.L., Hsiao, W.W.L., Van Domselaar, G., *The Integrated Rapid Infectious Disease Analysis (IRIDA) Platform*. BioRxiv 381830 (2018)
- o Leonard, G., Labarre, A., Milner, D. S., Monier, A., Soanes, D., Wideman, J. G., **Maguire, F.**, Stevens, S., Sain, D., Grau-Bové, X., et al. *Comparative genomic analysis of the 'pseudofungus' hyphochytrium catenoides*. Open biology 8, 1 (2018), 170-184
- o Richards, T. A., Leonard, G., Mahé, F., del Campo, J., Romac, S., Jones, M. D., **Maguire, F.**, Dunthorn, M., De Vargas, C., Massana, R., et al. *Molecular diversity and distribution of marine fungi across 130 european environmental samples*. Proceedings of the Royal Society B 282, 1819 (2015), 20152243
- o Chambouvet, A., Gower, D. J., Jirk, M., Yabsley, M. J., Davis, A. K., Leonard, G., **Maguire, F.**, Doherty-Bone, T. M., Bittencourt-Silva, G. B., Wilkinson, M., et al. *Cryptic infection of a broad taxonomic and geographic diversity of tadpoles by perkinsea protists*. Proceedings of the National Academy of Sciences 112, 34 (2015), E4743-E4751
- o Smith, D. J., Thakrar, P. J., Bharrat, A. E., Dokos, A. G., Kinney, T. L., James, L. M., Lane, M. A., Khodadad, C. L., **Maguire, F.**, Maloney, P. R., et al. *A balloon-based payload for exposing microorganisms in the stratosphere (E-MIST)*. Gravitational and Space Research 2, 2 (2014)
- o **Maguire, F.**, Henriquez, F. L., Leonard, G., Dacks, J. B., Brown, M. W., and Richards, T. A. *Complex patterns of gene fission in the eukaryotic folate biosynthesis pathway*. Genome Biology and Evolution 6, 10 (2014), 2709-2720
- o **Maguire, F.**, and Richards, T. A. *Organelle evolution: A mosaic of 'mitochondrial' functions*. Current Biology 24, 11 (2014), R518-R520
- o Chambouvet, A., Berney, C., Romac, S., Audic, S., **Maguire, F.**, De Vargas, C., and Richards, T. A. *Diverse molecular signatures for ribosomally 'active' perkinsea in marine sediments*. BMC Microbiology 14, 1 (2014), 110

## Submitted.....

- o **Maguire, F.**, Graven, M.A., MacDonald, N.E., *Data Ordinality: The Missing Link in Medical and Research Errors*
- o Stairs, J.A., Bergey, B., **Maguire, F.**, Scott, S., *Motivation to access laparoscopic skills training: results of a national survey of obstetrics and gynaecology residents*
- o Peabody, M., Lau, W.Y.V., **Maguire, F.**, Beiko, R.G., Brinkman, F., Hoad, G. *PSORTm: predicting bacterial and archaeal protein subcellular localization prediction tool from metagenomic data*
- o Tsang, K.K., **Maguire, F.**, Zubyka, H.L., Chou, S., Edalatmandi, A., Wright, G.D., Beiko, R.G., McArthur A. *Identifying known and novel antibiotic resistance genotype-phenotype relationships through antibiogram prediction*.

## Conferences

### Oral Presentations.....

#### MicroResearch

Workshop

Review of Mental Health Programs, Processes and Services for First Responders in the Halifax Regional Municipality

#### Canadian Society of Microbiology

Annual Conference

Precise identification of antimicrobial resistance determinants from metagenomic data

Dartmouth General Hospital, Halifax, NS

16-27 September 2019

Sherbrooke, QC

10-13 June 2019

**Faculty of Medicine Research Day** **Dalhousie University**  
*Faculty Conference* 13–14 May 2019  
 Identification of novel resistance gene activity via antibiotic susceptibility prediction models

**Faculty of Medicine Research Day** **Dalhousie University**  
*Faculty Conference* 13–14 May 2019  
 A collaborative examination of the online communities of autistic individuals

**Research Seminar** **Simon Fraser University**  
*Brinkman Lab* 26 March 2019  
 Socially Focused Research With Bioinformatics Tools

**Joint Departmental Seminar** **Universities of Auckland and Waterloo**  
*Remote presentation* 19 October 2018  
 AMRtime: Rapid Accurate Identification of Antimicrobial Resistance Determinants from Metagenomic Data

**American Society of Microbiology** **Washington, DC**  
*Rapid Applied Microbial NGS and Bioinformatic Pipelines Conference* 23–26 September 2018  
 AMRtime: Rapid Accurate Identification of Antimicrobial Resistance Determinants from Metagenomic Data

**Integrated Rapid Infectious Disease Analysis** **National Microbiology Labs, Winnipeg**  
*Annual General Meeting* 22 June 2018  
 Using Machine Learning Methods to Accurately Classify AMR in Metagenomic Data

**Dalhousie Computer Science In-House Conference** **Dalhousie University**  
*Departmental Conference* 24–26 January 2018  
 BayeHem: Bayesian Optimisation of Genome Assembly

**International Course on Antibiotics and Resistance** **Annecey, France**  
*Workshop* 11–19 November 2017  
 Understand and Using the Comprehensive Antibiotic Resistance Database

**Canadian Institute For Advanced Research** **Toronto, ON**  
*Integrated Microbiology Meeting* 1–5 June 2016  
 An Analysis of RNAi Pathway Components and Function in *Paramecium*

**Machine Learning for Life Sciences** **University of Exeter**  
*Workshop* 2nd June 2015  
 Casting a Deep Net: Classifying Plankton from Shadowgraph Images

**Machine Learning for Life Sciences** **University of Exeter**  
*Workshop* 1st June 2015  
 Stumbling Over the Decision Boundary

**European Molecular Biology Organisation** **EMBO Heidelberg**  
*Young Investigators Program* 2–7 December 2013  
 Endosymbiont Proteins Implicated in the Maintenance of the Photosynthetic Endosymbiosis between *Paramecium bursaria* and *Chlorella*

[Poster Presentations](#).....

**Canadian Society of Microbiology** **Sherbrooke, QC**  
*Annual Conference* 10–13 June 2019  
 Integrated Rapid Infectious Disease Analysis: A comprehensive platform for public health bioinformatics and AMR surveillance using genomic data

**Canadian Society of Microbiology** **University of Manitoba**  
*Summer Conference* 18–21 June 2018  
 The Cost of Speed: Evaluating Systematic Failures in Metagenomic AMR Profiling

**European Molecular Biology Organisation** **EMBO Heidelberg**  
*Young Investigators Program* 2–7th December 2013  
 Key Principles in Molecular Phylogenetics

**European Molecular Biology Organisation** **Sant Feliu de Guixols, Spain**  
*Comparative Genomics of Eukaryotic Microorganisms Conference* 19–24th October 2013  
 Endosymbiont Proteins Implicated in the Maintenance of the Photosynthetic Endosymbiosis between *Paramecium bursaria* and *Chlorella*

<b>Systematics Association</b> <i>Young Systematists Forum</i> Folate Biosynthesis Gene Fusion Evolution in the Eukaryotes	<b>Natural History Museum, London</b> 1st December 2011
<b>Society for General Microbiology</b> <i>Summer Conference</i> Evolution of Folate Biosynthesis Gene Fusion in the Eukaryotes	<b>University of York</b> 5–7th September 2011
<b>European Molecular Biology Organisation</b> <i>Comparative Genomics of Eukaryotic Microorganisms Conference</i> Evolution of Folate Biosynthesis Gene Fusions in the Eukaryotes	<b>Sant Feliu de Guixols, Spain</b> 15–20th October 2011
<b>Co-Authored Presentations</b> .....	
<b>Emerging Statistical Challenges: Analysis of Human Microbiome Data</b> <i>Talk</i> Has anyone seen my plasmid? Probing the dark corners of metagenome-assembled genomes	<b>Banff, BC</b> 15–20 September 2019
<b>Society of Environmental Toxicology and Chemistry</b> <i>Talk</i> Challenges and opportunities for microbiome analysis in toxicology	<b>Toronto, ON</b> 3–7 November 2019
<b>Intelligent Systems for Molecular Biology/ECCB</b> <i>Poster</i> Combining multiple features and algorithms to learn antimicrobial resistance genotype-phenotype relationships	<b>Basel, Switzerland</b> 21–25 July 2019
<b>ASM Microbe</b> <i>Talk</i> Prediction of Antimicrobial Resistance Genes and Mutations for Genomic and Metagenomic Sequencing Data	<b>San Francisco, CA</b> 20–24 June 2019
<b>ASM Microbe</b> <i>Poster</i> Resistome and Variant Prediction for Improved Antimicrobial Surveillance with the Comprehensive Antibiotic Resistance Database	<b>San Francisco, CA</b> 20–24 June 2019
<b>Applied Bioinformatics and Public Health Microbiology</b> <i>Poster</i> PSORTm and AMRtime: Adapting predictive genome-scale bioinformatic approaches to the challenges of metagenomic data	<b>EBI, UK</b> 5–7 June 2019
<b>Applied Bioinformatics and Public Health Microbiology</b> <i>Poster</i> Integrated Rapid Infectious Disease Analysis (IRIDA): a comprehensive and distributed platform for public health genomic epidemiology	<b>EBI, UK</b> 5–7 June 2019
<b>Canadian Conference on Medical Education</b> <i>Talk</i> Motivation to Access Laparoscopic Skills Training by Obstetrics and Gynaecology Residents: A Novel Tool to Characterize Motivation	<b>Niagra, ON</b> 11–16 April 2019
<b>CUGH: Translation and Implementation for Impact in Global Health Conference</b> <i>Poster</i> Halifax Newcomer Well Woman Clinic: Promoting the Health of Refugee Women Through Advocacy and Partnership	<b>Chicago, IL</b> 8–10 March 2019
<b>School of Informatics Jamboree</b> <i>Poster</i> Classifying Plankton Species with Deep Learning and Computer Vision	<b>University of Edinburgh</b> 26 March 2015
<b>National Association for Research in Science Teaching</b> <i>Poster</i> Working on the Public's Perception and Understand of Science and Scientists through a Popular, Open-Access 'AskScience' Website	<b>Indianapolis, IN</b> 25–28th March 2012
<b>Tennessee Maths and Science Education Research Conference</b> <i>Poster</i> Online Conversations as a Way of Understanding the Public's Views of the Natural of Science: Research on Reddit's 'AskScience'	<b>Murfreesboro, TN</b> 2–3rd February 2012

## Academic Associations

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- American Society of Microbiology
- Canadian Society of Microbiology
- Dalhousie Postdoctoral Union
- International Society of Infectious Disease
- British Phycological Society
- Universities and Colleges Union

## References

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- Robert G. Beiko, Canada Research Chair in Bioinformatics, Faculty of Computer Science, Dalhousie University (Postdoctoral supervisor), E-mail: beiko@cs.dal.ca
- Andrew McArthur, Cisco Research Chair in Bioinformatics, Department of Biochemistry and Biomedical Sciences, McMaster University (Collaborator), E-mail: mcarthua@mcmaster.ca
- Thomas A. Richards, Chair of Evolutionary Genomics, Living Systems Institute, University of Exeter (PhD supervisor), E-mail: T.A.Richards@exeter.ac.uk