BRODY H FOY

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EDUCATION

University of Oxford *Oct 2015 - Sep 2018*
D.Phil in Computer Science (Computational Biology)
Thesis Title: *Applied Mathematical Modelling of Pulmonary Function Tests*
Rhodes Scholarship

Queensland University of Technology *Jan 2011 - Dec 2014*
B.Math (Hons) in Applied and Computational Mathematics
GPA: 7.00 (out of 7.00)
University Medal

RESEARCH EXPERIENCE

Research Fellow 2018 - Present
Systems Biology/Pathology Department *Harvard Medical School/Massachusetts General Hospital*

- Use machine learning to identify novel clinical diagnostic and prognostic signals.
- Design mathematical models of blood cell dynamics to explore mechanistic responses to disease.
- Design image analyse pipelines to investigate cell morphology changes during inflammatory events

Co-Founder, Chief Technology Officer 2016 - 2018
Rhodes Artificial Intelligence Lab (RAIL) *Oxford, UK*

- Founded a non-profit AI research consultancy for social impact projects.
- Coordinated and supervised >30 graduate students on fast-paced interdisciplinary research projects.
- Example projects: Improving homeless service delivery for the NYC government; Drug discovery with Public Health England; Moderating internet toxicity with Google Jigsaw.

Research Assistant 2015
School of Mathematical Sciences *Queensland University of Technology*

- Designed new computational and mathematical techniques for simulating fluid flow.

SCHOLARSHIPS, FELLOWSHIPS, GRANTS

Postdoctoral

Mercatus FastGrants Program (Co-Author)	$ 40,000	2020
One Brave Idea Grant (Co-Author)	$180,000	2019
Schmidt Science Fellowship	Shortlisted finalist	2019

Postgraduate

Rhodes Scholarship	Full tuition and stipend	2015

Undergraduate

AMSI Vacation Research Scholarship	$ 6,000	2013
QUT Vice Chancellor's Scholarship	$ 24,000	2011
QUT Dean's Scholarship	Full tuition	2011

TEACHING EXPERIENCE

Instructor 2018 - Present
Health Sciences & Technology Stream *Harvard Medical School*

· Teach sections on biomedical mathematical modelling and data analysis for MD candidates. Courses are cross listed at Massachusetts Institute of Technology (graduate level).

Instructor 2016 - 2018
Multiple Departments *University of Oxford*

· Taught graduate level mathematics courses in the interdisciplinary Doctoral Training Centre.
· Tutored undergraduate students in applied mathematics.

Lecturer, Assistant Unit Coordinator 2015
Science & Engineering Faculty *Queensland University of Technology*

· Lectured undergraduate courses in engineering and mathematics. Wrote lectures, and assessment.
· Coordinated team of >10 teaching assistants in subject with >800 student enrolment.
· Received QUT Teaching Excellence Award due to overwhelmingly positive student feedback.
· From 2011-2014 ran tutorials, sections and practicals for > 10 subjects across multiple faculties.

VOLUNTEER EXPERIENCE

Logistics Manager 2014 - 2015
Spur Projects *Brisbane, AUS*

· Developed and implemented mental health programming across Australia.
· Helped coordinated How is the World Feeling? an international campaign with over 10,000 participants.

State Director (QLD) 2013 - 2014
Left-Right Think-Tank *Brisbane, AUS*

· Ran state branch of youth policy think-tank.
· Coordinated large team through policy research, writing, and advocacy to state and federal government.

Founder, President 2012 - 2014
Mathematics Society *Queensland University of Technology*

· Founded society, and built to >200 members within 2 years.
· Organised student mentoring programs, social programs and successfully advocated for student-oriented changes to the mathematics degree structure.

HONORS

QUT Performance Excellence Award	2015
QUT Teaching Excellence Award	2015
QUT University Medal (top graduating student)	2014
QUT Student Leader of the Year	2013
QUT Volunteer of the Year	2013
Australian Student Prize (top 500 secondary school students in country)	2010

PROFESSIONAL ASSOCIATIONS

American Society of Hematology
American Mathematical Society
Association of American Rhodes Scholars
Australian Rhodes Scholar Association

PUBLICATIONS

My research is focused on improving understanding of how inflammatory diseases affect hematologic and pulmonary function across multiple scales, and on utilizing this understanding to build novel clinical tools.

A full list of publications can be found at my personal website and my Google Scholar. Below is a selection of recent publications:

Hematology and Inflammation

BH Foy, T Sundt, JCT Carlson, AD Aguirre, JM Higgins. (2021). White blood cell and platelet dynamics define human inflammatory recovery. *medRxiv*.

BH Foy, JCT Carlson, E Reinertsen, et al. (2020). Association of red blood cell distribution width with mortality risk in adults hospitalized with COVID-19 infection. *JAMA Network Open*. **3**(9):e2022058.

S Cremer, MJ Schloss, C Vinegoni, **BH Foy**, et al. (2020). Diminished reactive hematopoiesis and cardiac inflammation in a mouse model of recurrent myocardial infarction. *Journal of the American College of Cardiology*. **75**(8): 901-915.

BH Foy, A Li, JP McClung, R Ranganath, JM Higgins. (2020). Data-driven physiologic thresholds for iron deficiency associated with hematologic decline. *American Journal of Hematology*. **95**(3): 302-309.

Pulmonary and Epidemiology

BH Foy, B Wahl, K Mehta, et al. (2021). Comparing COVID-19 vaccine allocation strategies in India: A mathematical modelling study. *International Journal of Infectious Diseases*. **103**: 431-438.

BH Foy, D Kay, S Siddiqui, CE Brightling, M Paiva, S Verbanck. (2020). Increased ventilation heterogeneity in asthma can be attributed to proximal bronchioles. *European Respiratory Journal*. **55(3)**.

BH Foy, S Natarajan, A Munawar, et al. (2020). Characterising the role of small airways in severe asthma using low frequency forced oscillations: A combined computational and clinical approach. *Respiratory Medicine*. **170**:106022.

BH Foy, M Soares, R Bordas, et al. (2019). Lung computational models and the role of the small airways in asthma. *American Journal of Respiratory and Critical Care Medicine*. **200**(8) 982-991.

BH Foy, D Kay. (2019). A computationally tractable scheme for simulation of the human pulmonary system. *Journal of Computational Physics*. **388**: 371-393.

AJ Bell, **BH Foy**, M Richardson, et al. (2019). Functional CT imaging for identification of the spatial determinants of small-airways disease in adults with asthma. *Journal of Allergy and Clinical Immunology*. **144**(1): 83-93.

PRESENTATIONS, SEMINARS AND POSTERS

Below is a selection of recent invited seminars, conference presentations and posters:

Hematology and Inflammation

Quantifying the hematologic dynamics of the human inflammatory response. *University of Melbourne, Department of Mathematical Biology*. 2021. (invited seminar).

Estimating the age of red blood cells through mathematical simulation: a validated population dynamics approach. *Joint Mathematical Meetings Conference*, Denver, USA. 2020. (conference presentation).

Linking preoperative risk to postoperative outcomes using routine clinical measurements. *MIT, Computational Medicine*. Cambridge, USA. 2019. (invited seminar).

Classifying inflammatory response using blood count trajectories and cell morphology. *Massachusetts General Hospital, Cardiac Surgery Division*. Boston, USA. 2019. (invited presentation).

Pulmonary and Epidemiology

Physiologic phenotyping: the role of computational modelling. *American Thoracic Society Congress*. 2021. (virtual conference symposium).

A combined computational-clinical approach to improving pulmonary function diagnosis. *Brigham and Women's Hospital, Applied Chest Imaging Laboratory*. Boston, USA. 2020. (invited seminar).

A computational framework for simulating the human pulmonary system. *Queensland University of Technology, School of Mathematical Sciences*. Brisbane, AUS. 2018. (invited seminar).

Low frequency lung resistance is a global bronchoconstriction detection measure, but is still sensitive to small airways disease. *American Thoracic Society Congress*. 2017. San Diego, USA. (poster session).

Sacin responds to total compliance heterogeneity and is less sensitive to regionalisation than scond. *American Thoracic Society Congress*. 2017. San Diego, USA. (poster session).

Other

RAIL: A model for social impact driven machine learning. *Bayesian and Big Data for Social Good Conference*, Marseille, FRA. 2018. (invited seminar).

REVIEW

I have acted as a reviewer for many journals, including: Nature Human Behaviour, Annals of Internal Medicine, American Journal of Respiratory and Critical Care Medicine, JAMA Network Open, Lancet Regional Health, Respiratory Medicine, Respiratory Physiology and Neurobiology, Journal of Asthma, Journal of Computational Physics, Journal of Mathematical Biology.

REFEREES

Associate Professor John M Higgins, MD
Systems Biology Department, Harvard Medical School
Department of Pathology, Massachusetts General Hospital
Relationship: Postdoctoral research advisor.
john_higgins@hms.harvard.edu

Associate Professor David Kay, PhD
Department of Computer Science, University of Oxford
Relationship: Doctoral thesis advisor
david.kay@cs.ox.ac.uk

Professor Salman Siddiqui, BM, FRCPF, PhD
Professor of Airway Disease and Respiratory Medicine
Leicester University and NIHR Respiratory Biomedical Research Unit
Relationship: Long standing research collaborator
ss338@le.ac.uk

Professor Ian Turner, PhD
School of Mathematical Sciences, Queensland University of Technology
Relationship: Undergraduate research advisor
i.turner@qut.edu.au