Andrew Fraser READ: CV

Address: Center for Infectious Disease Dynamics,
Departments of Biology and Entomology,
Millennium Science Complex,
The Pennsylvania State University,
University Park PA 16802, USA

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Nationality: New Zealand (by birth); UK (by naturalisation, 2003); US (by naturalization, 2016).

Current Position: Evan Pugh University Professor of Biology and Entomology (since 2014); Eberly Professor of Biotechnology (since 2015); Director, Center for Infectious Disease Dynamics (since 2010).

Previous Positions
Alumni Professor in the Biological Sciences (2012-2014), Penn State University
Professor of Biology (2007-2011) and Entomology (2007-2014), Penn State University
Professor of Natural History, University of Edinburgh [Chair established 1767; 13th occupant] (1998-2007)
BBSRC Advanced Research Fellowships (1993-1997, 1998)
Adjunct Professor in Evolutionary Ecology, University of Tromsø, Norway (1992-1997)
Lloyd's of London Tercentenary Fellowship (1991-1992)
Lecturer in Zoology, St Catherine's College, Oxford University (1989-90)
Junior Research Fellowship, Christ Church, Oxford (1988-1992)
Commonwealth Scholarship to Merton College, Oxford University (1985-1988)

Degrees:
D.Phil., University of Oxford (1985-89). [Evolutionary biology/zoology; Advisor: P. Harvey FRS]
BSc(Hons) 1st Class in Zoology, University of Otago, New Zealand (1981-84)

Awards:
Member, American Academy of Arts and Sciences (elected 2018)
Penn State President's Award for Excellence in Academic Integration (2018)
Fellow, The Royal Society (elected 2015)
Fellow, American Academy of Microbiology (elected 2014)
Fellow, American Association for the Advancement of Science (elected 2012)
Eberly College of Science Distinguished Senior Scholar, Pennsylvania State University (2007)
Fellow, Institute for Advanced Studies, Berlin (Wissenschaftskolleg zu Berlin) (sabbatical 2006-7)
Fellow, Royal Society of Edinburgh (elected 2003)
Scientific Medal, Zoological Society of London (1999)
Young Investigator Award, American Society of Naturalists (1991)
Thomas Henry Huxley Award (for D.Phil. thesis), Zoological Society of London (1991)

Summary of academic interests. My group works on the ecology and evolutionary genetics of infectious disease, particularly the pathogen evolution that harms human health and well-being. Can public health strategies, like vaccination, provoke clinically harmful evolution? Will an emergent disease become more or less virulent? How can we best manage the evolution of drug resistance? Our work involves evolutionary biology, ecology, parasitology, microbiology and genomics. Currently, much of the work is aimed at finding drug regimens that retard resistance evolution, understanding the rare cases where vaccine resistance has evolved, and identifying drivers of drug resistance in hospitals. Currently we mostly work with Marek's disease in poultry (vaccine resistance), myxoma virus in rabbits (virulence) and vancomycin-resistant *Enterococcus* (bacterial evolution in hospitals), with some malaria and cancer on the side. I have taught zoology, evolutionary biology, microbiology, parasitology, ecology and statistics, and currently teach non-scientists to be better consumers of science.

GRANTS

*(**=currently in play)*

Merck Investigator Studies Program (2017-2018). *Observational study of doctor-patient communication to identify interventions to reduce inappropriate antibiotic use for respiratory tract infections in an emerging adult population*. PIs: **Read, MacGregor (Department of Communication Arts and Sciences, PSU), Zook (University Health Services, PSU). Total Award: ~$180,000 over 18 months.

NIH/NIAID (2015-2020). *Variation in Resistance and Fitness to Artemisinins in African Malaria.* PI Jon Juliano, University of North Carolina; PSU subcontract PI: **Read. PSU Subcontract ~$150,000. R01AI121558

NIH, NIGMS and UK Biotechnology and Biological Research Council (2012-2017). *Vaccines as drivers of disease emergence: transmission ecology and virulence evolution.* PI: **Read**, Co-I: Nair (Pirbright Institute, UK), Dunn (PSU), Day (Queens, Canada). Funded as part of joint NSF-NIH-USDA Ecology and Evolution of Infectious Disease program as a US-UK collaboration. Total Award ~$3mil. R01GM105244.

CURE Epilepsy (2012-2014). *A murine model for preventing post-malarial epilepsy.* PI: Schiff (PSU UP), Co-I: **Read**, Gluckman, Drew (PSU UP), Stoute (PSU Hershey). Total award: $350,000.

Bill and Melinda Gates Foundation (2012-2017). *Diagnostic for malaria infection in humans.* PI: Mescher; Co-I: de Moraes, **Read**. Total Award ~$800,000.

European Commission (2012-2015). *A low-cost mosquito contamination device for sustainable malaria mosquito control.* PSU subcontract, PI: Thomas (PSU), Co-I: **Read**. Total award: ~$1mill.

NIH, NIAID (2012-2017). *Genomic analysis of the canonical case of virulence evolution: Myxomatosis in Australia.* PI: **Read**, Co-I: Holmes (Sydney), Cattadori, Hudson (PSU), Kerr (CSIRO Canberra), Ghedin (U Pitt). Total award ~$2.9 million. R01AI093804

NIH, NIAID (2011-2013). *Effects of temperature on mosquito immunity and vector competence: do some like it hot?* PI: Thomas (PSU); Co-I: **Read**, Cox-Foster (PSU). Total direct costs $275,000. R21AI096036.

NIH, NIAID. *Centre for the Study of Complex Malaria in India.* Total direct costs ~$US10 mill. PI: Jane Carlton, NYU. U19A1089676-01. I am involved in two component projects:

(i) *Using next-generation genomics to study antimalarial drug resistance in India*. (2010-2016). PSU subcontract PI: **Read**. Annual direct costs ~$75,000. India budget ten-fold higher.

(ii) *Ecological and evolutionary determinants of malaria transmission and the advance towards sustainable insecticidal mosquito control.* (2010-2017) PSU subcontract, PI: Thomas, Co-I: **Read**. Annual direct costs ~$90,000. India budget ten-fold higher.

NIH, NIAID (2010-2015). *Within host selection of* P. falciparum *variants by artemisinin combination therapies.* PI: Jon Juliano, University of North Carolina; PSU subcontract PI: **Read**. PSU Subcontract direct costs total $345,208. R01AI089819.

NIH, NIGMS R01 (2010-2014). *The evolutionary biology of chemotherapy against infectious agents: towards rational design of patient treatment regimens for resistance management.* PI: **Read** Total ~$1,150,000. R01 GM089932.

NIH, NIAID R21 (2010-2013) *Existing malaria control insecticides – without the evolution of insecticide-resistance mosquitoes?* PIs: **Read**, Co-I: Thomas (PSU). Total $250,697. R21 AI088094

Innovative Vector Control Consortium, Bill and Melinda Gates Foundation. (2010-2011). *Residual persistence and stability of candidate fungal biopesticides for IRS.* PIs: Thomas (PSU), **Read**. Total $101,284.

Bill and Melinda Gates Foundation (2010-2011). *Diagnostic for malaria infection*. PIs: M Mescher (PSU), C. de Morales (PSU), **Read**. $100,000.

The Wellcome Trust. (2010-2013). *Elucidating within-host competition between malaria parasites using mathematical models and Bayesian statistics*. (Total £152,942; all funding in Edinburgh). PIs: N. Savill (U. Edinburgh), **Read**. Ref. 091078/Z/09/Z.

NIH, Fogarty International Center, DHSS (2009-2013). *Intergovernmental Personnel Agreement for participation in Research and Policy for Infectious Disease Dynamics Program*. PI: **Read**. Total $250,000.

National Science Foundation/Ecology of Infectious Diseases Program. (2009-2013). *Quantifying the influence of environmental temperature on transmission of vector-borne diseases*. PI: M Thomas; Co-I: Crane, Mann, **Read** (PSU), Scott (UC Davis). Total ~$2.3mill. EF-0914384.

Pennsylvania Department of Health Tobacco Settlement Funds (2008-2011). *Research infrastructure for new pesticide technologies for control of insect-borne diseases like malaria*. PI: **Read**. Total $1,033,333

Bill and Melinda Gates Foundation (2009-2010). *Giving mosquitoes a 'head cold' to stop odor-driven feeding on humans*. PIs: Baker, Thomas, **Read** (all PSU). Total $100,000.

Grants prior to move to US

The Wellcome Trust. (2007-2009). *Host-parasite interactions elucidated by McMC-based Bayesian inference*. PIs: N. Savill, **Read**. £108,867. Ref. 082601.

Royal Society of New Zealand, Strategic Relocation Fund. *Infectious disease evolution: strategies to overcome resistance, virulence and vaccine escape.* $NZ9.7mill + matching funds from Otago University. PI: **Read**. *Declined*.

Wissenschaftskolleg zu Berlin (2006-7). Teaching replacement grant (to enable sabbatical leave). PI: **Read** €60,000.

BBSRC (2006-2010). *Studies leading to sustainable strategies for the control of Marek's disease: Is vaccination responsible for virulence evolution in Marek's disease?* PIs: **Read**, Nair (Institute of Animal Health, Compton, England). £713,930. Ref. BB/E003540/1.

The Wellcome Trust. (2006-2009). *Maximising the short-term efficacy of fungal biopesticide control of malaria*. PIs **Read**, Thomas (CSIRO Canberra). Terminated by Wellcome Trust 03/08 following move to US. £343,951. Ref. GR079077MA

The European Commission (2006-9). *The evolution of parasite virulence: ecological processes shaping virulence of* Ophryocystis *parasites in monarch butterflies and malaria parasites in mosquitoes.* PI: **Read**; Marie Curie International Fellowship to J de Roode. £169,426. Ref. FP6-2004-Mobility-6, Proposal No. 021353-Virulence Evolution.

The Wellcome Trust (2005-2008). *Parasite evolution in response to blood-stage malaria vaccines*. PI: **Read**; studentship to V. Barclay. £47,087. Ref. 075468/Z/04/A.

The Wellcome Trust (2004-2009). *Flow cytometry for immunology and parasitology.* PIs: Gray, Anderton, Maizels, Matthews and **Read**. £439,023. Ref. 075855/Z/04/Z.

BBSRC (2004-2007). *Evolution of sex allocation in protozoan parasites.* PIs: **Read** & S. West; Recognised Researcher, S. Reece. £183,094. Ref. BB/C509915/1

BBSRC (2004-2007). *Empirical immunology meets evolutionary ecology: the virulence of coinfection* [PIs: J. Allen, **Read** & S. Nee; Recognised Researcher, A. Graham]. £313,872. Ref. BB/C5087341.

The European Commission (2004-2005). *Genetically diverse infection, competition, and the evolution of parasite virulence*. PI: **Read**; Marie Curie Intr-European Fellowship to L. Råberg. €85,534. Ref. MEIF-CT-2003-501567.

The Wellcome Trust (2003-2006*). The role of inflammatory host cytokines and genetic diversity in the determination of malaria virulence*. PI: **Read**; studentship to G. Long. £50,175. Ref. 069299/Z/02/A

The Wellcome Trust (2003-2006). How does in-host competition affect transmission strategies in malaria parasites? PI: **Read**; studentship to A. Wargo. £107,453. Ref. 073094/Z/03/Z.

The Wellcome Trust (2002-2008). Programme Grant: *Parasite life history evolution in response to medical and veterinary intervention.* PI **Read**. £1,187,420. Ref 068292/Z/01/Z.

The Wellcome Trust (2002-2004). *Novel use of fungal entomopathogens for malaria control.* PI: **Read**. £130,038. Ref 068195/B/02/Z. (Supplement £1,750, ref 068195/B/02/A).

The Wellcome Trust (2002). *Centre for Infection Biology and Immunology* (for new Building – now Ashworth 3). PI's: Maizels, Robinson, Allen, Barton, Blaxter, Charlesworth, Gray, Keightley, Leigh Brown, Pemberton, **Read**. £4,734,289. Ref. 064641.

The Wellcome Trust (2001-03). *Developing optimal immunology*. PI's: **Read**, Allen, Nee. £84,335. Ref. 064121/Z/01/Z.

NERC (2000-3): *Does parasite-mediated selection generate dynamical gene frequency fluctuations in wild populations?* PI: **Read**; Recognized Researcher: T. Little. £264,017.

The Wellcome Trust (2001-02). *Do host-parasite arms races occur* ex silico? PI: **Read**. £82,276. Ref. 060770/Z/00/Z.

BBSRC (1997-8). *Evolutionary ecology of host responses to parasitic infection*. PI's: **Read**, Bryant (Stirling). £51,171.

BBSRC (1997-00). *Evolutionary causes and consequences of host responses to parasitic infection* [Fellowship support grant]; PI: **Read**. £138,018 + Read's salary.

The Leverhulme Trust (1997-00). *Evolutionary genetics of parasite virulence*. PI: **Read**. £105,270.

BBSRC (1996-00). *Testing mutational explanations of sexual reproduction*. PI's: **Read**, Barton,Viney; £198,116

The Leverhulme Trust (1996-97). *Is sexual reproduction by parasites an immune evasion strategy?* PI's: **Read**, Viney. £37,320

NERC (1995-98). *Immunocompetence versus ornamentation: an experimental study of sexually-selected breeding coloration and disease resistance in male sticklebacks.* PI's: Braithwaite, Huntingford (Glasgow) & **Read**. £134,270. GR3/10349.

BBSRC (previously AFRC) (1993-97). *Evolutionary ecology of parasite reproductive strategies* [Fellowship support grant]. PI: **Read**. £99,890 + Read's salary.

Leverhume Trust (1990-4). *Sex allocation and virulence in malaria parasites*. PI's: **Read**, Keymer (Oxford); £97,750.

NERC (1989-92). *Heritability of male quality in great tits*. C. Perrins & **Read** (Oxford). £65,000.

Leverhume Trust (1989-90): *Sex allocation and virulence in malaria parasites.* PI's: Keymer & **Read** (Oxford). £22,750.

PHD SUPERVISION

Monica Acosta (2012-current). PSU Biology. *Title TBC*. Advisor: **Read**.

Johanna Ohm (2013-2018). PSU Biology. *Mosquito Feeding and Fitness: An Exploration of Mosquito Diets and Behaviors that Impact Mosquito Fitness, with Applications for Mosquito Mass Rearing and Control.* Advisor: **Read**, Thomas [Currently considering several post-doc offers].

Nina Wale (2011-2015). PSU Biology. *Evolution-proofing Antimicrobial Drugs Using Resource-depleting Chemotherapy.* Advisor: **Read**. Winner, WD Hamilton Prize, Society for the Study of Evolution [Currently post-doc, University of Michigan].

Megan Greischar (2009-2014, NSF, NIH). PSU Entomology. *Predicting the Consequences of Diverse Life History in Malaria Parasites: Synchrony and Transmission Investment*. Advisors: Bjørnstad, **Read**. Winner of RA Fisher Prize, Society for the Study of Evolution [Currently post-doc, University of Toronto].

Katey Glunt (2008-2013, NIH). PSU Biology. *Understanding the Consequences of Sub-Lethal Insecticide Concentrations for Insecticide Resistance Management and Malaria Control.* Advisors: **Read**, Thomas. [Currently Post-doc, Thomas Lab, Penn State].

Penny Lynch (2004-2013, self-funding) (Open University PhD). *Mathematical Modelling of the Effects of Health Interventions on the Evolution of Life History in Disease-Causing Organisms.* Supervisors: Dr U. Grimm (Mathematics, Open University) and **Read**. [Currently City of London analyst and part time post-doc with Mike Boots, UC Berkeley].

University of Edinburgh

Silvie Huijben (2006-2009, Darwin Trust studentship). *Experimental Studies on the Ecology and Evolution of Drug-Resistant Malaria Parasites.* Supervisor: **Read**. [Stayed on as post-doc after our move to the US, then Branco Weiss Fellowship at the Barcelona Center for International Health, Spain, now Assistant Professor, Arizona State University].

Vicki Barclay (2005-2008, WT studentship). *Studies Evaluating the Possible Evolution of Malaria Parasites in Response to Blood-stage Vaccination.* Supervisor: **Read**. [Stayed on as post-doc after our move to the US, then post-doc, Salathe group, Penn State, now Associate Director, Gene Therapy Program, University of Pennsylvania].

Gráinne Long (2003-2006, WT studentship). *The Role of Inflammatory Host Cytokines and Genetic Diversity in the Determination of Malaria Virulence.* Supervisors: **Read,** Allen, Graham. [After post-docs at Penn State and University of Sheffield and Early Development Career Fellow, MRC Epidemiology Unit, Cambridge and Epidemiologist, Roche Pharmaceuticals, now at AstraZeneca, UK].

Katrina Grech (2003-2006, WT PGRA) (Open University). *The Ecology and Evolution of Malaria: Laboratory Studies of* Plasmodium chabaudi *and its Rodent and Insect Hosts*. Supervisor: **Read**. [Now Research Officer, Drug Modelling Program, University of New South Wales, Sydney after Research Scientist, Moredun Research Institute, Edinburgh].

Andrew Wargo. (2003-2006, WT Prize Studentship & ORS). *How Does In-host Competition Affect Transmission Strategies in Malaria Parasites?* Supervisor: **Read.** [Now Assistant Professor, Virginia Institute of Marine Science after post-doc, Dept Pathobiology, University of Washington, Seattle and at USGS Western Fisheries Research Center, Seattle].

Jaap de Roode (2001-2004, Darwin Trust). *Within-host Competition and the Evolution of Malaria Parasites.* Supervisor: **Read**. [Now Associate Professor, Biology Department, Emory University, GA, USA after Marie Curie International Travelling Fellowship, Athens, GA, USA;].

Meghan Gannon (2001-2004, NSF & ORS). *Plasticity in Reproductive Traits***.** Supervisors: **Read**, Little, West. [Buffalo Museum of Science, NY, USA after post-doc at Buffalo State College].

Lucy Crooks (1996-2004 [2 years abeyance on health grounds]; MRC studentship). *Gametocyte Investment in Malaria.* Supervisor: **Read**. [Now Senior Lecturer (Associate Prof), Genomics and Bioinformatics, Sheffield Hallam University, UK, after post-docs at Sanger Center, Cambridge, UK, Dept Animal Breeding and Genetics, Swedish University of Agricultural Sciences, Uppsala, and at the ETH Zurich].

Sarah Reece (2000-2003; NERC): *Evolution and Ecology of Sex Allocation.* Supervisors: West, **Read**. [Now Professor of Evolutionary Parasitology and Royal Society Fellow, University of Edinburgh, after NERC and Wellcome Fellowships, University of Edinburgh, following lectureship, University of Stirling].

Heather Ferguson (1999-2002; Science Faculty Scholarship & ORS). *The Ecology and Evolutionary Implications of Malaria Parasite Virulence in Mosquito Vectors*. Supervisor: **Read**. [Now Professor University of Glasgow,

after BBSRC David Phillips Fellowship, University of Glasgow and Ifakara Health Research and Development Centre, Ifakara, Tanzania].

Rebecca Timms (1997-2001; BBSRC studentship). *The Ecology and Evolution of Virulence in Mixed Infections of Malaria Parasites.* Supervisor: **Read**. [Now Director, Corporate Finance, Bank of Scotland].

Katrina Lythgoe (1996-1999; BBSRC studentship). *Genetic Variation in Structured Populations: Space, Time and the Red Queen.* Supervisors: Barton, **Read**. [Now Sir Henry Dale Research Fellow, University of Oxford, formerly held at Imperial College, London, after being editor *Trends in Ecology and Evolution*, following a Wellcome Travelling Fellowship at Dept. Biology, UC San Diego and with me in Edinburgh, and an MSc in Science Communication, Imperial College, London].

Alan Gemmill (1995-1999; NERC studentship). *Experimental and Comparative Analyses of the Evolutionary Ecology of Parasitic Nematodes*. Supervisors: **Read**, Viney. [Now Senior Research Officer, Austin & Repatriation Medical Centre, University of Melbourne].

Angus Buckling (1995-1998; MRC studentship). *Ecological and Evolutionary Effects of Intervention Strategies on the Transmission of Malaria Parasites.* Supervisor: **Read**. [Now Professor, University of Exeter, after Royal Society University Research Fellow and lecturer, Oxford University, following a lectureship, University of Bath].

Louise Taylor (1993-1997; MRC studentship). *Epidemiological and Evolutionary Consequences of Mixed-Genotype Infections of Malaria Parasites.* Supervisor: **Read**. [Now Scientific Director at Global Alliance for Rabies Control, Pittsburgh and Edinburgh, following a Wellcome Research Fellow at Centre for Tropical Veterinary Medicine, University of Edinburgh].

Tromsø University, Norway

Per Arneberg (1993-1996; research assistantship, University of Tromsø, Norway). *Commoness and Rarity among Mammalian Nematodes. A Comparative Study of Parasite Abundance.* Supervisors: Skorping, **Read**. [Now Research Scientist, Institute of Marine Research, Norway following Norwegian Research Council Fellowship, Tromsø University].

University of Oxford, England

Stephanie Schrag (1989-1993; Marshall Scholarship, Oxford). *Factors Influencing Selfing and Outcrossing Rates in the Freshwater Snail,* Bulinus truncatus. [Now Epidemiology Team Lead, CDC Atlanta, after Post-doc, Department of Biology, Emory University, Atlanta, USA]. Supervisors: **Read**, Keymer.

Supervisory committees

PSU: James Fraser (Molecular, Cellular and Integrative Biosciences, 2016-current), Lauren Quevillon (Biology, 2016-2018), Duverney Chaverra-Rodríguez (Entomology, 2016-current), Juan Raygoza (Biochemistry and Molecular Biology, 2015-2016), Suprita Singh (Biochemistry and Molecular Biology, 2015-current), Utsav Pandey (Biochemistry and Molecular Biology, 2015-2018), Elyse Munoz (Genetics, 2013-2017), Kezia Manlove (Biology, 2013-2016), Todd Bodmar (Biology, 2013-2015), Els Campbell (Biology, 2013-current), Raquel Loreto (Entomology, 2013-2016), Becky Hennig (Entomology, 2013-2015), John Parkinson (Biology, 2011-2014), Lindsay Beck-Johnson (Biology, 2009-2013), Maia Rabaa (Biology, 2010-2012), Rob Anderson (Entomology, 2009-2011), Ronnie Childs (Entomology, 2008-2011), Olivier Rolin (IID 2008-2012), Jennie Lavine (Entomology 2008-2011), Daniel Tyler (Tay) Pettay (Biology 2008-2011), Heather Simmons (Biology, 2007-2011), Cadhla Ramsden (Biology, 2007-2009), Sara Hester (BMB 2008-2012).
Edinburgh: A. Duncan, B. Craig, T. Lamb, R. Floyd, K. MacKenzie, L. Kruuk, C. Wade.
Oxford: R. Trevellyan, M. Sullivan.

RESEARCH ASSOCIATES, POST-DOCS AND SPONSORED POST-DOC FELLOWS

Current

Andy Bell (2003-2011; 2013-current). Senior Research Associate

Elsa Hansen (2013-current). Senior Research Associate

David Kennedy (2012-current). Senior Research Associate

Clare Kinnear (2016-current). Post-doc [based at University of Michigan]

Alumni

Eleanore Sternberg (2012-2014) [EU] Research Associate, Thomas Group, Penn State

Jessica Waite (2012-2015) [EU] Research Manager, Thomas Group, Penn State

Jacqui Montgomery (2013-2014) [NIH]. Project Development Director, Elminate Dengue, Monash Univerity, Australia.

Courtney Murdock (2009-2014) [NSF]. Assistant Professor, University of Georgia, Athens, GA.

Lauren Cator (2011-2014) [PSU]. Assistant Professor, Imperial College, London.

Simon Blanford (2002-2014) [NIH]. House dad.

Laura Pollitt (2012-2013) [NIH]. Statistician, Scottish Government, after Research Fellowship, University of Edinburgh.

Rahel Salathe (2011-2015) [PSU]. Mom and trainee viniculturalist.

Nicole Mideo (2012-2013) [NIH]. Assistant Professor, Toronto University.

Silvie Huijben (2009-2012) [NIH]. Assistant Professor, Arizona State University, after Branco Weiss Fellowship at the Barcelona Center for International Health, Spain.

Krijn Paaijmanns (2008-2012) [NSF]. Assistant Professor, Arizona State University, after Assistant Professor, Barcelona Center for International Health.

Sue Baigent (2008-2011) [BBSRC]. Pirbright Institute, UK. Retired.

Vicki Barclay (2008-2011). [PSU]. Associate Director, Gene Therapy Program, University of Pennsylvania, after Post-doc, Salathe lab, Penn State.

Kathryn Crouch (2006-8) [BBSRC]. In business.

Petra Schneider (2006-2007) [Wellcome Trust]. Post-doctoral Fellow, University of Edinburgh.

Simmi Mahajan (2005-2007) [BBSRC]. Returned to India, lost contact.

Damien Drew (2005- 2007) [BBSRC]. Senior Research Officer, Burnet Institute, Melbourne.

Lars Råberg (2004-2005) [Marie Curie Fellow]. Senior Lecturer, University of Lund.

Katrina Lythgoe (2001-2002) [Wellcome Trust Travelling Fellowship]. Sir Henry Dale Research Fellow, University of Oxford, formerly held at Imperial College, London, after being editor *Trends in Ecology and Evolution*, following a Wellcome Travelling Fellowship at Dept. Biology, UC San Diego, and an MSc in Science Communication, Imperial College, London.

Andrea Graham (2001-2004) [Wellcome Trust]. Associate Professor, Princeton University, after Leverhulme and BBSRC Fellowships at the University of Edinburgh.

Sylvain Gandon (2001- 2002) [Wellcome Trust Biomathematics Fellowship]. CNRS Research Director, Montpellier.

Sue Mitchell (2000-2004) [NERC]. Director, Spot-On Data Solutions, and Aeona, Executive Life Coaching and Leadership Development.

Tom Little (2000- 2002) [NSERC (Canada) then Wellcome Trust]. Full Professor, University of Edinburgh after SBS Research Fellowship and then Wellcome Trust Senior Research Fellow, University of Edinburgh.

Claus Wedekind (2000-2003) [Swiss Marie Curie Fellowship]. Associate Professor, University of Lausanne.

Marg Mackinnon (1998-2000) [Leverhulme]. Research Fellow, Wellcome Trust Unit, Kilifi, Kenya, after Dorothy Hodgkin Fellowship, Universities of Edinburgh and Cambridge.

Ana Rivero (1999-2000) [BBSRC]. CNRS Research Director, Montpellier, after post-doc in Montpellier and a Research Fellowship, Spain.

Stu West (1997-1999) [BBSRC]. Full Professor (Established Chair), University of Oxford, having been a Royal Society and BBSRC Fellow and Personal Chair, University of Edinburgh.

COMMUNITY SERVICE

- Member, Vaccines Advisory Panel, The Wellcome Trust, London (2017-current).
- Member, DFG Berlin Center Grant Review Panel, Therapeutic Resistance: Origins, Expansion, Solutions (2017).
- Invited Organizer, Plenary Session, ASM Microbe 2017, Evolutionary Battles Between Microbes and Hosts.
- Chair, Williams Prize Committee, International Society for Evolution, Medicine & Public Health (2016-2017).
- Chair, Omenn Prize Committee, International Society for Evolution, Medicine & Public Health (2016).
- Co-organized NIH/NIGMS workshop (2015): Ecology's Role in Population Genetics and Evolution (15 people from across the US). Bethesda, MD. Co-organizers: Sarah Schaack [Reed College] and Daniel Janes [NIH/NIGMS].
- External Scientific Advisory Committee, Center for Evolution and Medicine, Arizona State University (2015–current).
- Chair, Publications Committee, International Society for Evolution, Medicine & Public Health. (2015–current).
- Organised RAPIDD Workshop, Aquacultural Disease and the Evolution of Virulence (25 people from Europe & US). Co-organisers D. Kennedy [PSU] and G Kurath [USGS]. Seattle (2012).
- Organised RAPIDD Workshop, Evolution of Virulence from Wildlife to Farms (25 people from Europe, US and Asia). Co-organiser C.Webb, [Colorado State]. Fort Collins (2011).
- Steering Committee, American Academy of Microbiology Colloquium, *Designing Drugs That Last*. Philadelphia (2012).
- Co-organised NScent Catalysis Meeting (30 people from Europe and North America). Co-organized with S. Reece, N. Mideo, N. Savill, University of Edinburgh. Duke University (2011).
- Reviewer/interviewer, Strategic Awards Committee, The Wellcome Trust, London (2010).
- Scientific Advisory Board, DFG Priority Program Host-Parasite Coevolution, Germany (2009–2016).
- Scientific Advisory Board, Finnish Centre of Excellence in Evolutionary Research (2006–2011).
- Scientific Advisory Board, School of Biological Sciences, University of Cambridge (2006–2008).
- John Maynard Smith Prize Panel, European Society of Evolutionary Biology (2007).
- Philip Leverhulme Prize Panel for Zoology, The Leverhulme Trust, London (2006, 2008).
- NCEAS working group on Establishing Ecology & Health, Santa Barbara (2006).
- Heads of International Research Organizations (HIRO), Brainstorming Meeting on Ecology of Infectious Diseases, Bethesda, USA, (2005).
- Chair, External Review, Institute of Zoology (2003).
- Scientific Awards Committee, Zoological Society of London (2003-2007; Chair 2005–2007).
- External Examiner, BSc (Biology), University of Stirling (2001-2004).
- Vice Chair, Biodiversity Grant Panel, The Wellcome Trust (2000-2002).
- Member, Infection and Immunity Grant Panel, The Wellcome Trust (1997-2001).

- Member, SHoWCaSE Grant Panel, Wellcome Trust (1999).
- External PhD examiner: Australia (2013, 2014), France (2000), Norway (1999, 2004, 2011), Sweden (1995, 1998, 2002), Switzerland (1999), UK (1996, 1998, 1999, 2000, 2000, 2001).

EDITORIAL BOARDS

- Editorial Board *PLoS Biology* (2012–current).
- Advisory Board, *Evolutionary Applications* (2008–2012, 2018–current).
- Associate Editor, *Evolutionary Applications* (2012–2017).
- Senior Associate Editor, *Evolution, Medicine and Public Health* (2012–current).
- Associate Editor, *Evolution* (2009–2011).
- Editorial Board, *Proceedings of the Royal Society of London Series B* (2002–2008).
- Editorial Advisory Board, *Trends in Ecology and Evolution* (2000–current).
- Editorial Board, *Journal of Evolutionary Biology* (1996–2000).

TEACHING

Penn State

- SC200 – Science in Our World: Certainty and Controversy (2010–current). Course director. Conceived and developed course; teaching the vast majority of it. 70 non-science majors in 2010, 100 in 2011, 170 in 2012 and 2013, 205 in 2014, 330 in 2015, 357 in 2016 (sabbatical 2017). http://sites.psu.edu/siowreflections/
- Presentations on SC200 to PSU's e-Education Council, PSU's Symposium for Teaching and Learning with Technology, ECoS Dean's Alumni Advisory Board, Department of Biochemistry and Molecular Biology, and Deparment of Biobehavioral Health (all 2011).
- Guest Lecture, Penn State Altoona (2013).
- SC 297 Frontiers of Research, Lecture to 300 Freshman science students (2013, 2014).
- Guest lecture WSF460 Wildlife Behavior (2012).
- Two sessions with BMMB 598C Microbiology (2012, 2014, 2015).
- Two sessions with ENT 597A Frontiers in Insect Science (2009, 2012, 2013).
- Semester long grad course, BIOL 592 Evaluation of Biological Literature (2009).
- Co-taught semester long grad course ECOL 597 Evolutionary Ecology (2009).
- Undergrad researcher experience in the lab: Eric Choi (2017-current), Lindsey Jackson (2018-current), Samantha Olson (2018-current), Yumna Ahmed (2017-current), Clarisse Solis (2017-current), Taylor Ziegler (2016-current), Joash Lake (2015-current), Bridget Garrity (2016-current), Briana McLeod (2014-2017), Michelle Lai (2013-2017), Josh Bram (2012-2016), Rebecca Seliga (2010-2012), Courtney Babb (2011-2012), Melissa Moody (2010-2011), Lucas Nell* (2009-2010), Danielle Tomasello* (2008-2009). *=author on refereed lab papers.

University of Edinburgh

- Pathogen Evolution Module, 4th year Medical Microbiology (2003–2005). Course organizer, 4 lectures, plus associated computer practicals and tutorials.
- Malaria Module, 4th year Zoology course (2003–2006). Three lectures plus associated discussion sessions.
- Quantitative Zoology, 4th year Zoology course (1999–2006). Designed and developed course; course organizer, 12 lectures, plus associated computer practicals and tutorials.
- Evolution Core Module, 4th year Zoology course (1998–2003). Six lectures.
- Community and Population Biology, 1st year course (2000–2006). Five lectures and associated library project on Animal Extinction.

- Population and Community Ecology, 3rd year course (2000–2002). Four lectures and two associated practicals.
- Miscellaneous lectures in Evolutionary and Ecological genetics (3rd year) and Biometrics 2h (2nd year), and 0th week Gee-Whizz Evolution lecture for 1st year students.

Other
- Guest Lectures, Evolutionary Medicine courses at Queens and Toronto Universities (2016-2018).
- Faculty, Lausanne Graduate Workshop in Evolutionary Biology, Riederalp, Switzerland (2015).
- Guest Lecturer, Evolutionary Medicine course, Yale University (2012, 2013).
- Faculty, Guarda Workshop in Evolutionary Biology, Switzerland (2006, 2012).
- Tromsø University, Norway, graduate course in epidemiology (1993-1996).
- Supervision of 2-6 undergraduate projects per year at Edinburgh (1995–2006); five at Oxford (1987-1990).
- Undergraduate laboratory classes (Otago University 1983-1985).
- Undergraduate tutorials in evolution, behaviour and ecology (Oxford University 1986-1992).

UNIVERSITY SERVICE

Penn State
- Director, Center for Infectious Disease Dynamics (2010-current). www.cidd.psu.edu
- Chair, ECoS-Huck Resistance Evolution Faculty Cluster Hire (2017-current).
- Search Committee, Director Huck Institutes of Life Sciences (2017-2018).
- Steering Committee, Penn State's Keystone Institute (2016-2017).
- Enhancing Health Steering Committee, PSU Strategic Plan Implementation (2016-current).
- Huck Scientific Advisory Board on Global Health Biosecurity (2016-current).
- Chair, Seminar Committee, Department of Biology (2016-2017).
- Nominations Committee, Department of Entomology (2016-current).
- Chair, Search Committee, Professor of Entomology: Mosquito Transmission of Biosafety Level 3 Arboviruses (2016-7).
- Chair, Alex and Jessie C. Black Award for Excellence in Research Committee, College of Ag Sci (2016).
- Search Committee, BSL3 Faculty, Department of Veterinary and Biomedical Science, College of Ag Sci (2015-2017).
- Search Committee, Academic Administrator Replacement, Department of Biology (2015).
- Search committee, Chair of Biology (2015).
- Search committee, Dean, Eberly College of Science (2014-2015).
- Tombrose Fellow responsible for general education development, Center for Excellence in Science Education, Eberly College of Science, Penn State (2012-2014).
- Directors Advisory committee (kitchen cabinet), Huck Institute for Life Science (2013–current).
- Huck Institute Transformative Science award committee, Huck Institute for Life Science (2012-3).
- Awards Committee, Department of Entomology (2011-2014).
- Department Head Advisory Committee, Department of Entomology (2012-2014).
- Mentoring Committee, Department of Biology (2007–2016).
- Faculty Mentor: Jesse Lasky (Assistant Professor, Dept. Biology, 2016-current), Heather Hines (Assistant Professor, Dept. Biology, 2013-current), Ping Du (BIRCWH Scholar, Assistant Professor, Division of Epidemiology, Dept. Public Health Sciences, 2010–2013); David Hughes (Assistant Professor , Dept. Entomology, 2011–tenure 2017); Matt Ferrari (Assistant Professor, Dept. Biology, 2011–tenure 2016); Marcel Salathe (Assistant Professor, Dept. Biology, 2011–2015, left PSU pre-tenure), Isabella Cattadori (Assistant Professor, Dept Biology, 2009–tenure, 2014).
- Seminar Organizer, Entomology Department (2010-2011).
- Promotion and Tenure Review Committee, Department of Biology (2010–2012).
- Huck Infectious Disease Cluster Hire Umbrella Committee (Chair) (2009–2011) [*c.*15 faculty hired].
- Advisory/Long Term Planning Committee, Department Biology (2009–current).

- Promotion and Tenure Review Committee, Department of Entomology (2009–2011).
- Faculty and Staff Awards Committee, Department of Biology (2008–current).
- Candidacy Committee, Department of Biology (2009–2016).
- Graduate Committee, Department of Biology (2007–2008).

Edinburgh

- Convener of Exam Board, Evolutionary Biology Honours (2005–2006).
- Convener of Exam Board, Zoology Honours (1999–2006).
- Convener of Exam Board, Animal Biology 2h, Parasite Biology 3M, and Behavioural Ecology 3M (1999–2006).
- Convener of Exam Board, Population and Community Ecology 3 (2004–2006).
- Chairman, Davis Trust Committee (2000–2006).
- Management Committee, Centre for Infectious Diseases (2003–2006).
- Management Advisory Group, ICAPB (1998–2004).
- SBS Animal Units Management Group (1999–2006).
- Steering Committee, School of Biology (1999–2003).
- Chairman of Examiners, Parasitology Honours (1999–2003).
- Faculty Research Staff Review Board (1999–2001).
- Member, University Disciplinary Tribunals and Grievance Committee (1999–2003).
- Internal PhD examiner: 1995 [Blackman], 1998 [Healer], 1999 [Wedgewood-Oppenheim], 2001 [Rokas], 2002 [Aboobaker].

PUBLIC OUTREACH

- Penn State Village. Invited talk: *Antibiotic Resistant Superbugs.* 2017.
- Research Unplugged, Schlow Library, State College. Invited talk: *Antibiotic Resistant Microbes: Threat to American Lives and Global Economy.* 2017.
- 23rd Annual American Society for Microbiology Conference on Undergraduate Education (ASMCUE). Invited talk: *Overwhelming Evolution. Patients, Microbes and the Darwinian Process.* 2016.
- University Health Services, University Park. Invited seminar (Continuing Medical Education): *Antimicrobial resistance, patients and the Darwinian process*. 2016.
- 21st Annual Advances in Physiology & Pharmacology in Anesthesia and Critical Care, Wake Forest Baptist Medical Center NC held at the Hilton Head Island, SC. Special Lecture (Continuing Medical Education): *Our bugs are getting smarter, are we?* 2014.
- Penn State. Eberly Family Distinguished Lecture: *Medicine and the (mis)Management of Evolution*. 2015.
- Wissenshaftskolleg zu Berlin, Public Lecture: *When Evolution Matters.* 2014.
- Coursera MOOC: *Epidemic – the Dynamics of Infectious Diseases*. I am one of 8 PSU faculty involved in producing this course; I produced 8 videos and contributed to overall course design. Ran from October 2013. https://www.coursera.org/course/epidemics
- Palo Alto Institute. Invited speaker, Evolutionary Medicine symposium. 2012.
- TedMed, Washington DC. Invited speaker. 2012. http://www.youtube.com/watch?v=cvXc9aMF6CA
- NESCent, NC. Member, working group *"Infusing Premedical and Medical Education with Evolutionary Thinking"*. 2012-2013.
- Mt Desert Island Biological Laboratories, Maine. Co-organizer and teaching faculty on CME course *Evolutionary Foundations for Medicine and Public Health with special emphasis on Cancer and Infections*. 2012.
- Penn State. Invited public lecture in the ECoS series *Epidemic! Infectious Disease on a Changing Planet.* 2011. http://science.psu.edu/news-and-events/lectures-and-events/frontiers/watch-videos/epidemic.
- Penn State Physician CME Weekend, Annual Physician Alumni Gathering. Invited lectures. 2010, 2013.
- Princeton University, NJ. Public lecture sponsored by Princeton University Press: *The Future of Infectious Disease in a Pharmaceutical Age*. 2010.
- BBC Horizon Documentary 'Are humans still evolving?' Major contributor. 2010.

- Pennsylvania Veterinary Medical Association, 9th Annual Spring Clinic. Invited speaker. 2007.
- Festival of Science, British Association for the Advancement of Science. Invited public lecture. 2007
- International Congress of Parasitology, Glasgow, UK. Invited public lecture. 2006.
- British Association for the Advancement of Science Media Fellow 2003. Six week placement with *The Irish Times,* Dublin, culminating in a week covering the BA Festival of Science. For full list of published stories, plus thoughts and a sample of published articles see http://www.thereadgroup.net/author/andrew/. 2003.
- Acadia University, Canada. 17th Annual Huggins High School Science Seminar. Invited Keynote. 2002.
- University of Edinburgh, Faculty of Science and Engineering. Invited public lecture. 1997.

SABBATICALS AND SIGNIFICANT LEAVE

- ETH Zürich, Switzerland (Sabbatical 2017-18).
- Department of Internal Medicine, Division of Infectious Diseases, University of Michigan Medical School (Research Leave, March-August 2014).
- Wissenshaftskolleg zu Berlin (Sabbatical from University of Edinburgh, 2006-7).

INVITED CONFERENCE PRESENTATIONS AND RESEARCH SEMINARS

2018

Louis A. Bloomfield Memorial Medical Lecture, School of Medicine, Case Western Reserve University, Ohio (October).
International Society of Evolution, Medicine & Public Health Annual Meeting, Salt Lake City, UT (August) (invited plenary).
Wenner Gren Conference, Antibiotic Resistance, Stockholm, Sweden (June) (Invited speaker).
European Society for Paediatric Infectious Diseases, Malmo, Sweden (June) (Invited speaker).
University of Zürich, Department of Plant and Microbiol Biology, Switzerland (June) (Invited seminar)
University Hospital of Zürich, Department of Infection and Microbiology, Zürich, Switzerland (May) (Invited seminar).
Swiss Federal Institute of Aquatic Science and Technology, Zürich, Switzerland (Invited seminar)
ETH Zürich, Department of Integrative Biology, Switzerland (Invited seminar).
Darwin Birthday Lecture, Institute of Cancer Research, London, UK.

2017

Max Planck Institute for Evolutionary Biology, Plön, Germany (Invited seminar).
Kiel University, Department of Evolutionary Ecology and Genetics, Germany (Invited seminar).
Glaxo Smith Kline, Workshop: *Prioritizing vaccines to fight antimicrobial resistance* Wavre, Belgium (Invited speaker).
American Society for Microbiology, Microbe 2017, New Orleans (Invited plenary).
New York University School of Medicine, Department of Microbiology (Invited seminar).

2016

Penn State Hershey Medical School (Invited speaker, Grand Rounds).
Penn State MD/PhD Retreat (Invited speaker).
NIH National Institute of Allergy and Infectious Diseases, Rockview, MD (Invited seminar).
ISGlobal, Barcelona, Spain (Invited seminar).

2015

Georgetown University, Department of Biology, Washington DC (Invited seminar).
NIH/NIGMS, Workshop: *Ecology's Role in Population Genetics and Evolution*, Bethesda, MD (Invited speaker).
Royal Society-National Academy of Sciences Sackler USA-UK Scientific Forum *Trends in Synthetic Biology and Gain of Function and Regulatory Implications* London (Invited speaker).

ETH Zürich Latsis Symposium, *Drug Resistance*, Switzerland (Invited speaker).
University of Lausanne, Department of Ecology and Evolution, Switzerland (Invited seminar).
Inaugural Meeting, Foundation for Evolution, Medicine and Public Health, Phoenix, AZ (Invited speaker).
Dendy Keynote Address, International Poultry Scientific Forum, Atlanta.

2014
MEEGID XII – 12th International Conference on Molecular Epidemiology and Evolutionary Genetics of Infectious Disease, Bangkok, Thailand (Keynote speaker).
NSCent Celebration, Durham NC (Invited speaker).
University of Michigan, Department of Ecology and Evolutionary Biology (Invited seminar).
10th International Symposium on Marek's Disease and Avian Herpseviruses, East Lansing, Michigan (Accepted talk).
Yale University, School of Public Health (Invited seminar).
UCLA, Department of Ecology and Evolutionary Biology (Invited seminar).
EPFL, Department of Life Sciences, Switzerland (Invited seminar).
British Society for Parasitology, Annual Conference, Cambridge, UK (Invited speaker).
University of Michigan, Department of Ecology and Evolutionary Biology, Young Investigator Symposium (Invited keynote).
Arizona State University, School of Life Sciences (Invited seminar).
North Carolina State, Department of Genetics (Graduate student invited seminar).

2013
Yale University, Department of Ecology and Evolutionary Biology (Invited seminar).
Foundation Mérieux, Annecy France, Meeting, *Vaccination: An Evolutionary Engine for Species?* (Invited speaker).
Drexel University College of Medicine, PA (Invited seminar).
Intecol Congress, London, UK (Invited Speaker).
Gordon Conference, Microbial Population Biology (Plenary speaker).
2nd International Biannual Evolution and Cancer Conference, UCSF (Plenary speaker).
American Society of Naturalists, Vice Presidential Symposium, Snowbird, Utah (Invited speaker).
British Society for Parasitology Annual Conference, Bristol, UK (Plenary conference speaker + Keynote speaker in the associated British Ecological Society Special Interest Symposium).
University of Chicago Medical School (Invited seminar).
University of Chicago, Department of Ecology and Evolution (Invited seminar).
UCLA Medical School (Invited, Grand Rounds).

2012
Avian Disease and Oncology Laboratory, ARS, USDA, East Lansing, Michigan (Invited seminar).
RAPIDD Drug Resistance and Coinfection Workshop, Princeton University (Invited speaker).
Ecology and Evolution of Infectious Disease Annual Meeting, Berkeley (Invited speaker).
Yale University, Department of Ecology and Evolutionary Biology (Invited seminar).
Kansas State University, Division of Biology (Invited seminar).
University of Vermont, Department of Biology (Invited seminar).
Institute for Science and Technology, Austria (Invited seminar).
University of Hawaii, Department of Pharmacology, Hilo (Invited seminar).

2011
University of Bergen, Department of Biology, Norway (Invited seminar).
University of Rochester, Department of Biology, NY (Invited seminar).
International Meeting on Malaria and Related Haemosporidian Parasites of Wildlife, NSF-sponsored Research Coordination Network for Haemosporida of Terrestrial Vertebrates (Plenary speaker).
American Association of Veterinary Parasitologists/Livestock Insect Workers Conference/International Symposium of Ectoparasites of Pets, St Louis, Missouri (Plenary speaker).
National Institutes of Health, Laboratory of Parasitic Diseases, Bethesda MD (Invited seminar).
Stanford University School of Medicine CA, Department of Microbiology and Immunology (Invited seminar).
Louis Thaler Lecture, IFR "Biodiversité", Montpellier, France.

Vanderbilt University, Department of Biological Sciences, Nashville TN (Invited seminar).
National Academy of Sciences Colloquium *In the Light of Evolution V: Cooperation*, Irvine CA (Invited speaker).

2010
Keystone Symposium, *Molecular Targets for Control of Vector-Borne Diseases: Bridging Lab and Field Research*, Copper Mountain, Colorado (Invited speaker)
Princeton University, Department of Ecology and Evolutionary Biology, NJ (Invited seminar).
Walter Reed Army Institute of Research, MD (Invited, Distinguished Speakers Seminar Program)

2009
Epidemics^2 Conference, Athens, Greece (Invited keynote speaker).
University of Lausanne, Switzerland, Meeting: *Implications of Evolution for Human Health* (Invited speaker).
University of Jyväskylä, Finnish Centre of Excellence in Evolutionary Research, Finland (Invited seminar).
Institute for Animal Health, Compton, UK (Invited seminar).
MITACS Summer School, *Mathematics of Evolution and Invasions in Ecology and Epidemiology*, Banff International Research Station for Mathematical Innovation and Discovery, Canada (Invited speaker).
University of Virginia, Department of Biology (Invited seminar).

2008
American Museum of Natural History, NY (Invited seminar).
Johns Hopkins Bloomberg School of Public Health, Department of Molecular Microbiology and Immunology (Invited seminar).
ESF Exploratory Workshop: *Re-evaluating the Extended Phenotype Paradigm in Evolutionary Biology*. Copenhagen, Denmark (Invited participant).
NIH National Institute of Allergy and Infectious Diseases, Twinbrook campus, MD (Invited seminar).
University of Maryland, Department of Entomology (Invited seminar).
The American College of Epidemiology, Annual Meeting, Symposium: *The Dawn of Evolutionary Epidemiology: Applying Evolutionary Theory in an Epidemiologic Context*, Tucson, AZ (Invited speaker)
University of Notre Dame, Department of Biology, IL (Invited seminar).
Ecology and Evolution of Infectious Disease Conference, Fort Collins, Colorado (Invited speaker)
University of Jyväskylä, Finnish Centre of Excellence in Evolutionary Research, Finland (Invited seminar).
Wissenschaftkolleg zu Berlin, Workshop: *New Opportunities at the Evolution Medicine Interface*, Germany (Invited speaker).
Yale University, Symposium: *Evolutionary Medicine* (Invited speaker).

2007
XIth Congress of European Society for Evolutionary Biology. Uppsala, Sweden (Invited speaker).
ESF conference: *The Impact of the Environment on Innate Immunity*, Obergurgl, Austria (Invited speaker).
ETH Zürich, Department of Experimental Ecology, Switzerland (Invited seminar).
Emory University, Department of Biology, Atlanta, GA (Invited seminar).
Penn State University, Department of Biology, PA (Invited seminar).
Wissenschaftkolleg zu Berlin, Germany (Invited seminar).

2006
University of Jyväskylä, Finnish Centre of Excellence in Evolutionary Research, Finland (Invited seminar).
European Molecular Biology Laboratory, 8th International EMBL PhD Student Symposium: *Biology of Disease, A Molecular Battlefield*, Heidelberg, Germany (Invited speaker).
University of Basel, Department of Biology, Switzerland (Invited seminar).

2005
University of Glasgow, Wellcome Trust Centre for Molecular Parasitology (Invited seminar).
Gordon Conference, Malaria, Oxford (Invited speaker).
Xth Congress of European Society for Evolutionary Biology, Krakow, Poland (Invited speaker).
Queens University, Department of Biology, Canada (Invited seminar).

University of Toronto, Department of Zoology, Canada (Invited seminar).
Centre for Discrete Mathematics and Theoretical Computer Science (DIMACS) *Workshop on Evolutionary Considerations in Vaccine Use*. Rutgers University, New Jersey, USA.

2004
Journées Scientifiques, Laboratories «Functioning and Evolution of Ecological Systems» and «Evolutionary Parasitology» Paris, France (invited speaker).
Jacques Monod Conference *Evolutionary Ecology of Host-Parasite Relationship*. Roscoff, France (invited speaker).
7th International Symposium on Marek's disease. Oxford, UK (Invited speaker).
Max Planck Institute for Limnology, Plön, Germany (Invited seminar).
Ecology and Evolution of Infectious Diseases Meeting, Emory University, GA (Invited speaker).
2nd International Malaria Research Conference, Johns Hopkins Malaria Research Institute, MD (Invited speaker).
Society of Infectious Diseases and Foundation of Infectious Diseases of the Netherlands, Symposium, *Vaccine Safety and Arthropod-borne Viral encephalitis: Cross-roads Between Individual Patient Care and Public Health Care*, Utrecht, The Netherlands (Invited speaker).

2003
XXI Symposium Scandinavian Society for Parasitology, Bergen, Norway (Invited plenary speaker).
ETH Zürich Latsis Symposium *Evolution, Immunity and Infectious Disease,* Switzerland (Invited speaker).

2002
University of Lund, Department of Biology, Sweden (Invited seminar).
Association for Tropical Biology, Panama (Invited speaker).
University of Edinburgh, Centre for Infectious Diseases, Annual Symposium, UK (Invited speaker).
Keele University, Department of Biology, UK (Invited seminar).
Symposium of the NGW Vaccine Working group: *Vaccines and the Evolution of Virulence*, UMC Utrecht, The Netherlands (Invited speaker).
Centre for Ecology and Evolution, UCL, Institute of Zoology and Imperial College, Symposium: *Evolutionary and Ecological Aspects of Disease and Parasitism* (Invited speaker).
Burt Memorial Lecture, St Andrew's University, UK.
University of Utah, Department of Biology (Invited seminar).
Keystone Symposium. *Malaria's Challenge: From Infants to Genomics to Vaccines*, Keystone, CO (Invited speaker).

2001
VIIIth Congress of European Society for Evolutionary Biology. Aarhus, Denmark (Invited plenary).
University of Stirling, Institute of Biological Sciences, UK (Invited seminar).
University of Sunderland, Ecology Center, Department of Biology, UK (Invited seminar).
Imperial College, NERC Advances in Ecology Course, Silwood Park, UK (Invited seminar).
NERC Centre for Ecology and Hydrology, Banchory, Aberdeenshire, UK (Invited seminar).
Institute for Animal Health, Compton, UK (Invited seminar).
Association for Study of Animal Behaviour, Summer Conference *Interfacing Behaviour with Other Di*sciplines. Glasgow, UK (Invited speaker).
British Society for Parasitology, Autumn Symposium: *Parasite Variation: Ecological and Immunological Consequences*, London (Invited speaker).
Hinxton Retreat, *Infectious Disease: Host-Pathogen Evolution,* Wellcome Trust Genome Campus, Cambridge, UK (Invited Speaker).
Indiana University, Department of Biology and Centre for Integrative Study of Animal Behavior, *W.D. Hamilton International Symposium Bloomington*, US. (Invited speaker).
Wellcome Trust Centre for the Epidemiology of Infectious Disease, Zoology Department, University of Oxford, UK (Invited seminar).

2000
British Society for Parasitology, The Royal Society of Tropical Medicine and Hygiene & The American Society for Tropical Medicine and Hygiene. Joint Meeting: Oxford 2000, UK (Invited plenary).

Imperial College, Centre for Population Biology, Silwood Park, UK (Invited seminar).
University of Sussex, Department of Biology, UK (Invited seminar).

Last century (recorded from 1993)
ETH Zürich, Department of Experimental Ecology, Switzerland (Invited seminar). 1999.
University of Montpellier, Laboratory of Ecology, ESF Workshop: *The Evolutionary Biology of Host-Parasites Relationships: Models Meet Reality*, France (Invited speaker). 1999.
University of Maryland and the Smithsonian Institution (NSF-Research Training Group), Symposium: *Effects of Small Population Size on the Evolutionary and Ecological Dynamics of Parasitism*, Washington D.C. (Invited speaker). 1998.
Wageningen University, Department of Biomolecular Sciences, Symposium: *Molecular Ecology*, The Netherlands (Invited speaker). 1998.
Baltic and Scandanvian Societies of Parasitology, Symposium: *Ecology of Bird-Parasite Interactions,* Vilnius, Lithuania (Invited speaker). 1998.
University of Uppsala, Department of Zoology, ESF Workshop: *Ecological Immunology*, Sweden (Invited speaker). 1998.
University of Sheffield, Department of Animal and Plant Sciences, UK (Invited seminar). 1998.
University of Groningen, Zoological Laboratory, Workshop: *Ecological Immunolog*y, The Netherlands (Invited speaker).1998.
International Institute for Advanced Systems Analysis, Workshop: *Virulence Management: Between Theory and Experiment*, Laxemburg, Austria. (Invited speaker). 1997.
University of Bäsel, Department of Integrative Biology, Switzerland (Invited seminar). 1997.
ETH Zürich, Department of Experimental Ecology, and University of Zürich, Department of Biology, Switzerland (Invited seminar). 1997.
Max-Planck-Institute für Verhaltenphysiologie, International Summer School: *The Evolution of Sex*, Seewiesen, Germany (Invited speaker). 1997.
University College London, Department of Biology, UK (Invited seminar). 1997.
Glasgow University Zoology Society, UK (Invited seminar). 1997.
European Multicolloquium of Parasitology VII, Parma, Italy (Invited talk). 1996.
St Andrew's University Biology Society, UK (Invited seminar). 1995.
Uppsala University, Department of Zoology, Sweden (Two invited seminars). 1995.
Cambridge University, Zoology Department (Invited seminar). 1995.
University of Otago, Department of Zoology, 6th Annual Student Colloquium, New Zealand (Invited keynote speaker). 1994.
University of Otago, Zoology Department, New Zealand (Invited seminar). 1994.
International Congress of Genetics, Birmingham, UK (Invited talk). 1993.

Andrew Fraser READ: PUBLICATIONS

pdfs: www.thereadgroup.net

KEY PUBLICATIONS SINCE 2010

Wale et al. (2017). Resource limitation prevents the emergence of drug resistance by intensifying within host competition. *PNAS* 114: 13779

Kerr *et al.* (2017) The next step in the on-going arms race between myxoma virus and wild rabbits in Australia is a novel disease phenotype. *PNAS* 114: 9397

Kennedy & Read (2017). Why does drug resistance readily evolve but vaccine resistance does not? *PRSB* 284: 20162562

Hansen *et al.* (2017). How to use a chemotherapeutic agent when resistance to it threatens the patient. *PLoS Biology* 15: e2001110.

Day & Read (2016). Does high-dose antimicrobial chemotherapy prevent the evolution of resistance? *PLoS Computational Biology* 12: e1004689.

Read *et al.* (2015). Imperfect vaccination can enhance transmission of highly virulent pathogens. *PLoS Biology* 13: e1002198.

Huijben *et al.* (2013). Aggressive chemotherapy and the selection of drug resistant pathogens. *PLoS Pathogens* 9: e1003578.

Barclay *et al.* (2012). The evolutionary consequences of blood-stage vaccination on the rodent malaria *Plasmodium chabaudi*. *PLoS Biology* 10: e1001368.

Read *et al.* (2011). The evolution of drug resistance and the curious orthodoxy of aggressive chemotherapy. *PNAS* 108: 10871

PEER-REVIEWED PUBLICATIONS

In press

De Moraes, V.M., Wanjiku, C., Stanczyk, N., Pulido, H., Sims, J., Betz, H.S., **Read, A.F.**, Torto, B. & Mesche, M.C. (in press) Volatile biomarkers of symptomatic and asymptomatic malaria infection in humans. *Proceedings of the National Academy of Science USA*.

Kennedy, D.A. & **Read, A.F.** (in press) Why the evolution of vaccine resistance is less of a concern than the evolution of drug resistance. *Proceedings of the National Academy of Science USA*

Kennedy, D.A., Dunn, P.A., & **Read, A.F.** (in press). Modeling Marek's disease virus transmission: a framework for evaluating the impact of farming practices and evolution on disease. *Epidemics*

2018

212. Woods, R.J., Patel, T.S., Nagel, J.L., Newton, D.W., & **Read, A.F.** (2018). Institution-wide and within-patient evolution of daptomycin susceptibility in vancomycin-resistant *Enterococcus faecium* bloodstream infections. *Infection Control and Hospital Epidemiology* 39: 226-228. PMID29331166

2017

211. Wale, N., Sim, D.G., Jones, M.J., Salathe, R., Day, T., & **Read, A.F.** (2017). Resource limitation prevents the emergence of drug resistance by intensifying within host competition. *Proceedings of the National Academy of Science USA* 114: 13774-13779. PMC29233945. Winner, Omenn Prize 2017, ISEMPH Paper of the Year in evolution related to medicine and public health.

210. Kerr. P.J., Cattadori, I., Liu, J., Sims, D., Dodds, J., Brooks, J., Kennett, M., Holmes, E.C., & **Read, A.F.** (2017). The next step in the on-going arms race between myxoma virus and wild rabbits in Australia is a novel disease phenotype. *Proceedings of the National Academy of Science USA* 114: 9397-9402. PMC5584459

209. Liu, J., Cattadori, I.M., Sim, D.G., Eden, J-S., Holmes, E.C., **Read, A.F.**, & Kerr, P.J. (2017). Reverse engineering field isolates of myxoma virus demonstrates that some gene disruptions or loss of function do not explain virulence changes observed in the field. *Journal of Virology* 91: e01289-17. PMC5625522

208. Wale, N., Sim, D.G., & **Read, A.F.** (2017). A nutrient mediates intraspecific competition between rodent malaria parasites in vivo. *Proceedings of the Royal Society of London Series B* 284: 20171067. PMC5543226

207. Kennedy, D.A., Cairns, C., Jones, M.J., Bell, A.S., Salathe, R., Baigent, S.J., Nair, V.K., Dunn. P.A., & **Read A.F.** (2017). Industry-wide surveillance of Marek's disease virus on commercial poultry farms. *Avian Diseases* 61: 153-164. PMC28665725

206. Kennedy, D.A., & **Read A.F.** (2017). Why does drug resistance readily evolve but vaccine resistance does not? *Proceedings of the Royal Society of London Series B* 284: 20162562. PMC5378080

205. Kerr, P.J., Cattadori, I., Rogers, M.B., Fitch, A., Geber, A., Liu, J., Sim, D.G., Boag, B., Eden, J-B., Ghedin, E., **Read, A.F.**, & Holmes, E.C. (2017). Genomic and phenotypic characterization of myxoma virus from Great Britain reveals multiple evolutionary pathways distinct from those in Australia. *PLoS Pathogens* 13: e1006252. PMC5349684

204. Ssentongo, P., Robuccio, A.E., Thuku, G., Sim, D.G., Nabi, A., Bahari, F., Shanmugasundaram, B., Billard, M., Geronimo, A., Short, K.W., Drew, P.J., Baccon, J., Weinstein, S.L., Gilliam, F.G., Soute, J.A., Chincilli, V., **Read, A.F.**, Gluckman, B.J., & Schiff, S.J. (2017). A murine model to study epilepsy and SUDEP induced by malaria infection. *Scientific Reports* 7:43652. PMC5341121

203. Beck-Johnson, L.M, Nelson, W.A, Paaijmans, K.P., **Read, A.F.**, Thomas, M.B., & Bjornstad, O.N. (2017). The importance of temperature fluctuations in understanding mosquito population dynamics and malaria risk. *Royal Society Open Science* 4: 160969. PMC5383843

202. Hansen, E.A., Woods, R.J., & **Read, A.F.** (2017). How to use a chemotherapeutic agent when resistance to it threatens the patient. *PLoS Biology* 15: e2001110. PMC5300106

2016

201. Pandey, U., Bell, A.S., Renner, D.W., Kennedy, D.A., Shreve, J.T., Cairns, C.L., Jones, M.J., Dunn, P.A., **Read, A.F**., & Szpara, M.L. (2016). DNA from dust: comparative genomics of large DNA viruses in field surveillance samples. *mSphere* 1: e00132-16. PMC5064450

200. Greischar, M.A., Mideo, N., **Read, A.F.**, & Bjørnstad, O.N. (2016). Predicting optimal transmission investment in malaria parasites. *Evolution*70:1542-1558. PMC4991358

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