

## D R . A N D R E W H A M M O N D

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**EDUCATION**

2008 – 2011 04/10/08-01/07/11	Imperial College London	BSc (Hons) Biology Class 2,1
2012 – 2016 02/04/12-01/06/16	Imperial College London	PhD in Molecular Biology Supervisors: Andrea Crisanti & Tony Nolan

**PhD Thesis: The development of gene drives for genetic control of the malaria mosquito**

Gene drives have the potential to modify entire populations of insects for sustainable vector control. This thesis describes the first gene drive system designed for population control of the malaria mosquito as well as the development of CRISPR-based genome engineering technologies for *Anopheles gambiae*.

**RESEARCH****John's Hopkins University, Imperial College London & Oxford University**

Feb 2019 - current	Sir Henry Wellcome Postdoctoral Research Fellow Sponsored by Dr Tony Southall, Dr Conor McMeniman & Prof Stephen Goodwin - Investigating the neurogenetics underlying mosquito attraction to humans
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**Department of Life Sciences, Imperial College London**

June 2016 – Feb 2019	Post-Doctoral Research Associate in the Crisanti lab: - <i>An investigation into the creation, selection and potential mitigation of drive-resistant mutations</i> - <i>Development of the first gene drive to eliminate entire populations of caged insects</i> - <i>Development of CRISPR-based system to generate extreme male bias in mosquitoes</i> - <i>Development of driving sex distortion system for population suppression in mosquitoes</i> - <i>Model evaluating the requirements for driving anti-pathogen effectors into mosquito populations</i>
Apr 2012 – Jun 2016 (Viva voce Oct 2017)	PhD student in the Crisanti lab under supervision of Prof Andrea Crisanti and Dr Tony Nolan: - <i>Development of CRISPR genome engineering technologies and the first gene drive system for use in the malaria mosquito (first author publication in Nature Biotechnology)</i>
May 2011 – Oct 2011	Research Assistant in the Crisanti lab under supervision of Dr Nikolai Windbichler: - <i>Using transcriptomics and RNA-labelling to identify early zygotic genes in the malaria mosquito</i>

**Wellcome Trust Centre for Human Genetics, University of Oxford**

Jul 2010 – Sep 2010	Summer Research Project under supervision of Prof. Jonathan Flint and Dr Binnaz Yalcin <i>Bioinformatics-based approach to automate detection of indels, copy numbers gains, inversions and complex rearrangements in mammalian genomes (acknowledged in publication in Nature)</i>
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**FUNDING**

Feb 2019 – 2023	<i>Sir Henry Wellcome Postdoctoral Fellowship (£300,000)</i> <i>Imperial College London, Oxford University &amp; John's Hopkins University</i> "Dissecting the molecular genetics underlying mosquito attraction to humans" The project will combine the tools of optogenetics, neurobiology, genome engineering and behavioural assays to study the neural circuits guiding host-seeking behaviour in the African malaria mosquito <i>Anopheles gambiae</i> .
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**AWARDS**

2020	Winner	<b>Biochemical Society Early Career Researcher Award</b>
2019	Winner	<b>Imperial College President's Award for Outstanding Early Career Researcher</b>
	2 <sup>nd</sup> Prize	<b>Falling Walls Young Innovator of the Year (London)</b>
2018	1 <sup>st</sup> Prize	<b>Oral Presentation Annual Symposium of Wellcome Trust-Imperial Centre for Global Health Research</b>
2017	1 <sup>st</sup> Prize	<b>Oral Presentation Imperial College London Life Sciences Post-Doc Symposium</b>
	2 <sup>nd</sup> Prize	<b>Poster Presentation EMBO – Molecular and Population Biology of Mosquitoes and Other Disease Vectors</b>
	Finalist	<b>STEM for Britain National Science Competition, UK Parliament</b>
2014	1 <sup>st</sup> Prize	<b>Annual PhD Competition Department of Life Sciences, Imperial College London</b>

## SELECTED SEMINARS AND CONFERENCE PRESENTATIONS

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- Keynote Speaker     *Vita Scientia, Vilnius, Lithuania (03 Jan 2020)*  
*3rd International Conference on CRISPR Technologies, Hamburg, Germany (18 Sep 2019)*
- Invited Speaker     *The 3<sup>rd</sup> Annual Genome Editing Congress, London, UK (9-10 Nov 2017)*  
*Emerging Science Convention, Hamburg, Germany (9 Nov 2017)*  
*The 7<sup>th</sup> International Congress of the SOVE, Majorca, Spain (8 Nov 2017)*  
*Fifth meeting of the Transgenic Rat ImmunoPhenomic platform, France (11 May 2017)*
- Oral Presentation     *Molecular and population biology of mosquitoes and other disease vectors, Kolymbari, Greece (24-28 July 2017)*  
*Conference on Transposition and Genome Engineering, Nara, Japan (17-20 Nov 2015)*

## MEMBERSHIP

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*Member of the Royal Society of Biology, Member of the Biochemical Society, Member of the Society for Vector Ecology, Member of ANTI-VeC Application of Novel Transgenic technology & Inherited symbionts to Vector Control, Fellow of the Zoological Society of London*

## TEACHING

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### Workshops

Instructor, speaker and co-organiser at practical workshops designed to teach advanced techniques in genome engineering such as CRISPR, Gal4/UAS, insect transformation and gene drive. I am currently organizing future workshops to take place throughout Africa.

- *Insect Genetic Technologies Research Coordination Network's Technical Workshop* in Washington, USA from May-June 2018
- *TReND genome editing course* in Kenya from May-June 2017, and in June 2019.

### Teaching and Mentoring

I thoroughly enjoy teaching and have over 7 years of teaching experience. Undergraduate courses - "Advanced topics in parasitology & vector biology", "Parasitology", "Genes & genomics" and "Cell Biology". Project supervision – 20 master's students, 17 undergraduates and 6 school summer research students.

## OUTREACH

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During my PhD I became actively engaged in efforts to communicate my research, and the incredible potential of genome engineering. I have continued this passion since, becoming more active in discussions surrounding the ethics of genome engineering technologies.

- **Science festivals:** Organization and participation in Science Museum Lates events (2016-2018), the Imperial Festival (2016-2018), and the Great Exhibition Road Festival (2019), in each case giving live interactive demonstrations of the malaria mosquito.
- **Media interviews:** Short and feature length documentaries produced with more than 10 broadcasters including a working production with Netflix and a the BBC Tomorrow's World short entitled "Should we engineer mosquito DNA to save human lives?" (<http://www.bbc.co.uk/guides/zcsdb82>). I conduct regular interviews for radio/written media such as The Smithsonian, MIT Technology Review and NPR.
- **Teaching materials:** Creation of teaching materials co-developed with the Danish Ministry for Higher Education to be used by their national school system. This included a short documentary about my research and a written article about genome engineering technologies and gene drive. I then participated in a live event televised across schools in the country.
- **Ethics debates and Public Lectures:** Royal Society (2017), Politiken (2016), and a live televised event as part of Denmark's national science festival that culminated in an ethics debate with several of the country's leading ethicists (<https://videnskab.dk/genedrive>).
- **School Lectures and tours:** I regularly receive school students for tours of my laboratory, and give lectures at schools across the UK.

## REFERENCES

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- Prof. Andrea Crisanti – Imperial College London ([a.drcri santi@imperial.ac.uk](mailto:a.drcri santi@imperial.ac.uk)), Dr. Tony Nolan – Liverpool School of Tropical Medicine ([t.nolan@imperial.ac.uk](mailto:t.nolan@imperial.ac.uk)), Dr. Conor McMeniman – John's Hopkins University ([cmcmeni1@jhu.edu](mailto:cmcmeni1@jhu.edu)) lectures at schools across the UK.

## PUBLICATIONS

Articles: 12 (First author = 7)

Citations: 1014

h-index: 8

\* Equal contribution

Article	Year	Citations
Alekos Simoni*, <a href="#">Andrew Hammond</a> *, Andrea Beaghton, Roberto Galizi, Chrysanthi Taxiarchi, Kyros Kyrou, Dario Meacci, Matthew Gribble, Giulia Morselli, Austin Burt, Tony Nolan, Andrea Crisanti (2020) A driving sex distorter system causes population suppression in the human malaria mosquito <i>Anopheles gambiae</i> . <i>Nature Biotechnology</i> (accepted)	2020	0
Andrea K Beaghton, <a href="#">Andrew Hammond</a> , Tony Nolan, Andrea Crisanti, Austin Burt (2019) Gene drive for population genetic control: non-functional resistance and parental effects. <i>Proceedings of the Royal Society B</i> . 286 (1914), 20191586. PMID: 31662083	2019	1
<a href="#">Andrew M Hammond</a> , Kyros Kyrou, Matthew Gribble, Xenia Karlsson, Ioanna Morianou, Roberto Galizi, Andrea Beaghton, Andrea Crisanti, Tony Nolan (2018) Improved CRISPR-based suppression gene drives mitigate resistance and impose a large reproductive load on laboratory-contained mosquito populations. <i>BioRxiv</i> . doi: <a href="https://doi.org/10.1101/360339">https://doi.org/10.1101/360339</a>	2018	7
Kyros Kyrou* & <a href="#">Andrew Hammond</a> *, Roberto Galizi, Nace Kranj, Austin Burt, Andrea K Beaghton, Tony Nolan, Andrea Crisanti (2018) A CRISPR–Cas9 gene drive targeting doublesex causes complete population suppression in caged <i>Anopheles gambiae</i> mosquitoes. <i>Nature biotechnology</i> . 36(11):1062-1066. PMID: 30247490	2018	151
<a href="#">Andrew M. Hammond</a> & Roberto Galizi (2018) Gene drives to fight malaria: current state and future directions. <i>Pathogens and global health</i> . 111(8):412-423. PMID: 29457956	2018	26
Federica Bernardini, Roya Elaine Haghghat-Khah, Roberto Galizi, <a href="#">Andrew Marc Hammond</a> , Tony Nolan, Andrea Crisanti (2018) Molecular tools and genetic markers for the generation of transgenic sexing strains in Anopheline mosquitoes. <i>Parasites &amp; Vectors</i> . 11(660) PMID: 30583738	2018	5
Federica Bernardini, Roberto Galizi, Mariana Wunderlich, Chrysanthi Taxiarchi, Nace Kranjc, Kyros Kyrou, <a href="#">Andrew Hammond</a> , Tony Nolan, Mara N. K. Lawniczak, Philippos Aris Papatianos, Andrea Crisanti and Nikolai Windbichler (2017) Cross-Species Y Chromosome Function Between Malaria Vectors of the <i>Anopheles gambiae</i> Species Complex. <i>Genetics</i> . 207(2):729-740. PMID: 28860320	2017	12
<a href="#">Andrew Hammond</a> *, Kyros Kyrou*, Marco Bruttini, Ace North, Roberto Galizi, Xenia Karlsson, Nace Kranjc, Francesco M. Carpi, Romina D'Aurizio, Andrea Crisanti, Tony Nolan (2017) The creation and selection of mutations resistant to a gene drive over multiple generations in the malaria mosquito. <i>PLoS Genetics</i> . 13(10):e1007039. PMID: 28976972	2017	83
Andrea Beaghton, <a href="#">Andrew Hammond</a> , Tony Nolan, Andrea Crisanti, H. Charles J. Godfray and Austin Burt (2017) Requirements for Driving Anti-pathogen Effector Genes into Populations of Disease Vectors by Homing. <i>Genetics</i> . 205(4):1587-1596. PMID: 28159753	2017	30
Maria L Simões, Yuemei Dong, <a href="#">Andrew Hammond</a> , Ann Hall, Andrea Crisanti, Tony Nolan, George Dimopoulos (2016). The <i>Anopheles</i> FBN9 immune factor mediates <i>Plasmodium</i> species-specific defense through transgenic fat body expression. <i>Developmental &amp; Comparative Immunology</i> . 95(5): 444. PMID: 22216006	2017	9
<a href="#">Andrew Hammond</a> , Roberto Galizi, Kyros Kyrou, Alekos Simoni, Carla Siniscalchi, Dimitris Katsanos, Matthew Gribble, Dean Baker, Eric Marois, Steven Russell, Austin Burt, Nikolai Windbichler, Andrea Crisanti, Tony Nolan (2016). A CRISPR-Cas9 gene drive system targeting female reproduction in the malaria mosquito vector <i>Anopheles gambiae</i> . <i>Nature biotechnology</i> . 34(1):78-83. PMID: 26641531	2016	620
Roberto Galizi* & <a href="#">Andrew Hammond</a> *, Kyros Kyrou, Chrysanthi Taxiarchi, Federica Bernardini, Samantha M O'Loughlin, Philippos-Aris Papatianos, Tony Nolan, Nikolai Windbichler, Andrea Crisanti (2016). A CRISPR-Cas9 sex-ratio distortion system for genetic control. <i>Scientific Reports</i> . 6:31139. PMID: 27484623	2016	67
<a href="#">Andrew Hammond</a> . & Tony Nolan (2014). Sex-, tissue- and stage-specific transgene expression. In: Benedict, M. (Ed.), <i>Transgenic insects: techniques and applications</i> (pp. 29-50). Oxfordshire, UK: CABI. isbn=978-1-78064-451-6	2014	2