

Philippos Aris Papathanos

Department of Entomology

[Insect Genetics Lab](#)

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Education

- 2002–05 BACHELOR OF SCIENCES IN MOLECULAR BIOLOGY AND GENETICS
Royal Holloway, University of London, Egham, Surrey, UK
First Class Honors
- 2005–09 DOCTOR OF PHILOSOPHY
Imperial College London, London, UK
Title: Development of a gene drive system for genetic engineering of natural populations of the African malaria vector
Phd Advisor: Professor Andrea Crisanti

Academic Positions

- 2009–10 Postdoctoral Research Fellow
Imperial College London
Advisor: Professor Andrea Crisanti
- 2011–13 EMBO Postdoctoral Fellow
California Insititute of Technology
Advisor: Professor Bruce Hay
- 2013–14 Marie Curie Research Fellow
Department of Experimental Medicine
University of Perugia
- 2014–17 Montalcini Research Fellow and Group Leader
Department of Experimental Medicine
University of Perugia
- 2017–18 Associate Professor
Department of Experimental Medicine
University of Perugia
- 2018– Senior Lecturer
Department of Entomology
Hebrew University of Jerusalem

Articles and Preprints

* indicates co-first authorship or corresponding authorship

1. Homing endonuclease mediated gene targeting in *Anopheles gambiae* cells and embryos. Windbichler N*, **Papathanos PA***, Catteruccia F, Ranson H, Burt A, Crisanti A. *Nucleic Acids Research*; 2007;35(17):5922-33
2. Targeting the X chromosome during spermatogenesis induces Y chromosome transmission ratio distortion and early dominant embryo lethality in *Anopheles gambiae*. Windbichler N*, **Papathanos PA***, Crisanti A. *PLoS Genetics*; 2008 Dec;4(12):e1000291
3. The vasa regulatory region mediates germline expression and maternal transmission of proteins in the malaria mosquito *Anopheles gambiae* : a versatile tool for genetic control strategies. **Papathanos PA***, Windbichler N*, Menichelli M, Burt A, Crisanti A. *BMC Molecular Biology*; 2009 Jul 2;10:65
4. Sex separation strategies: past experience and new approaches. **Papathanos PA**, Bossin HC, Benedict M, Catteruccia F, Malcolm CA, Alphey L, Crisanti A. *Malaria Journal*. 2009 Nov 16;8 Suppl 2:S5; Review.
5. Developing transgenic *Anopheles* mosquitoes for the sterile insect technique. Nolan T, **Papathanos PA**, Windbichler N, Magnusson K, Benton J, Catteruccia F, Crisanti A. *Genetica*; 2011 Jan;139(1):33-9; Review
6. A synthetic homing endonuclease-based gene drive system in the human malaria mosquito. Windbichler N, Menichelli M, **Papathanos PA**, Thyme SB, Li H, Ulge UY, Hovde BT, Baker D, Monnat RJ Jr, Burt A, Crisanti A. *Nature*; 2011 May 12;473(7346):212-5
7. Transcriptional regulation of sex-biased genes during ontogeny in the malaria vector *Anopheles gambiae*. Magnusson K, Mendes AM, Windbichler N, **Papathanos PA**, Nolan T, Dottorini T, Rizzi E, Christophides GK, Crisanti A. *PLoS One*; 2011;6(6):e21572
8. Demasculinization of the *Anopheles gambiae* X chromosome. Magnusson K, Lycett GJ, Mendes AM, Lynd A, **Papathanos PA**, Crisanti A and Windbichler N. *BMC Evolutionary Biology*; 2012 May 18;12:69
9. Identification of germline transcriptional regulatory elements in *Aedes aegypti*. Akbari OS*, **Papathanos PA***, Sandler JE, Kennedy K, Hay BA. *Scientific Reports*; 2014 Feb 4;4:3954.
10. Site-specific genetic engineering of the *Anopheles gambiae* Y chromosome. Bernardini F, Galizi R, Menichelli M, **Papathanos PA**, Dritsou V, Marois E, Crisanti A, Windbichler N. *PNAS*; 2014 May 27;111(21):7600-5
11. Mosquito genomics. Highly evolvable malaria vectors: the genomes of 16 *Anopheles* mosquitoes. Neafsey DE, Waterhouse RM, Abai MR, Aganezov SS, Alekseyev MA, Allen JE, Amon J, Arcà B, Arensburger P, Artemov G, Assour LA, Basseri H, Berlin A, Birren BW, Blandin SA, Brockman AI, Burkot TR, Burt A, Chan CS, Chauve C, Chiu JC, Christensen M, Costantini C, Davidson VL, Deligianni E, Dottorini T, Dritsou V, Gabriel SB, Guelbeogo WM, Hall AB, Han MV, Hlaing T, Hughes DS, Jenkins AM, Jiang X, Jungreis I, Kakani EG, Kamali M, Kemppainen P, Kennedy RC, Kirmizoglou IK, Koekemoer LL, Laban N, Langridge N, Lawniczak MK, Lirakis M, Lobo NF, Lowy E, MacCallum RM, Mao C, Maslen G, Mbogo C, McCarthy J, Michel K, Mitchell SN, Moore W, Murphy KA, Naumenko AN, Nolan T, Novoa EM, O'Loughlin S, Oringanje C, Oshaghi MA, Pakpour N, **Papathanos PA**, Peery AN, Povelones M, Prakash A, Price DP, Rajaraman A, Reimer

- LJ, Rinker DC, Rokas A, Russell TL, Sagnon N, Sharakhova MV, Shea T, Simão FA, Simard F, Slotman MA, Somboon P, Stegny V, Struchiner CJ, Thomas GW, Tojo M, Topalis P, Tubio JM, Unger MF, Vontas J, Walton C, Wilding CS, Willis JH, Wu YC, Yan G, Zdobnov EM, Zhou X, Catteruccia F, Christophides GK, Collins FH, Cornman RS, Crisanti A, Donnelly MJ, Emrich SJ, Fontaine MC, Gelbart W, Hahn MW, Hansen IA, Howell PI, Kafatos FC, Kellis M, Lawson D, Louis C, Luckhart S, Muskavitch MA, Ribeiro JM, Riehle MA, Sharakhov IV, Tu Z, Zwiebel LJ, Besansky NJ. Science 2015 Jan 2;347(6217):1258522.
12. A draft genome sequence of an invasive mosquito: an Italian *Aedes albopictus*. Dritsou V, Topalis P, Windbichler N, Simoni A, Hall A, Lawson D, Hinsley M, Hughes D, Napolioni V, Crucianelli F, Deligianni E, Gasperi G, Gomulski LM, Savini G, Manni M, Scolari F, Malacrida AR, Arcà B, Ribeiro JM, Lombardo F, Saccone G, Salvemini M, Moretti R, Aprea G, Calvitti M, Picciolini M, **Papathanos PA**, Spaccapelo R, Favia G, Crisanti A, Louis C. Pathogens and Global Health; 2015 Jul;109(5):207-20
13. Radical remodeling of the Y chromosome in a recent species radiation of malaria mosquitoes. Hall AB*, **Papathanos PA***, Sharma A*, Cheng C*, Akbari OS, Assour L, Bergman NH, Cagnetti A, Crisanti A, Dottorini T, Fiorentini E, Galizi R, Hnath J, Jiang X, Koren S, Nolan T, Radune D, Sharakhova MV, Steele A, Timoshevskiy VA, Windbichler N, Zhang S, Hahn MW, Phillippy AM, Emrich SJ, Sharakhov IV, Tu ZJ, Besansky NJ. PNAS; 2016 Apr 12;113(15):E2114-23.
14. A CRISPR-Cas9 sex-ratio distortion system for genetic control. Galizi R, Hammond A, Kyrou, O'Loughlin SM, **Papathanos PA**, Taxiarchi C, Bernardini F, Nolan T, Windbichler N, Crisanti A. Scientific Reports; Sci Rep. 2016 Aug 3;6:31139.
15. Rapid evolution of female-biased genes among species of malaria mosquitoes. Papa F, Windbichler N, Lawniszak M, Waterhouse RM, Cagnetti A, D'Amato R, Presampieri T, Nolan T, **Papathanos PA***, Genome Research 2017 Jul 26. pii: gr.217216.116.
16. Cross-species Y-chromosome function between malaria vectors of the *Anopheles gambiae* species complex. Bernardini F, Galizi R, Wunderlich MR, Taxiarchi C, Kyrou K, Nolan T, Hammond A, **Papathanos PA**, Crisanti A, Windbichler N, Genetics 2017 Aug 31 pii: genetics.300221.2017.
17. Redkmer: An assembly-free pipeline for the identification of abundant and specific X-chromosome target sequences for X-shredding by CRISPR endonucleases. **Papathanos PA*** and Windbichler N, The CRISPR Journal 2018 Feb 1(1): 88-98. 10.1089/crispr.2017.0012
18. Rationally-engineered reproductive barriers using CRISPR & CRISPRa: an evaluation of the synthetic species concept in *Drosophila melanogaster*. Waters AJ, Capriotti P, Gaboriau D, **Papathanos PA**, Windbichler N. Scientific Reports; 2018 Sep 3;8(1):13125.
19. A perspective on the need and current status of efficient sex separation methods for mosquito genetic control. **Papathanos PA***, Bourtzis K, Tripet F, Bossin H, Virginio JF, Capurro ML, Pedrosa MC, Guindo A, Sylla L, Coulibaly MB, Yao FA, Epopa PS, Diabate A; Parasite and Vectors; 2018 Dec 24;11(Suppl 2):654. doi: 10.1186/s13071-018-3222-9.
20. Integral Gene Drives: an "operating system" for population replacement. Nash A, Urdaneta GM, Beaghton AK, Hoermann A, **Papathanos PA**, Christophides G, Windbichler N; Biology Open; 2019 Jan 3;8(1). pii: bio037762. doi: 10.1242/bio.037762.
21. Maleness-on-the-Y (MoY) orchestrates male sex determination in major agricultural fruit fly pests. Meccariello A, Salvemini M, Primo P, Hall B, Koskinioti P, Dalikova Ma, Gravina A, Gucciardino

MA, Forlenza F, Gregoriou ME, Ippolito D, Monti SM, Petrella V, Perrotta MM, Schmeing S, Ruggiero A, Scolari F, Giordano E, Tsoumani KT, Marec F, Windbichler N, Nagaraju J, Arunkumar KP, Bourtzis K, Mathiopoulos KD, Ragoussis J, Vitagliano L, Tu Z, **Papathanos PA***, Robinson MD, Saccone G; bioRxiv 2019, doi: <https://doi.org/10.1101/533646> *currently in review at Science*

Book chapters

1. Sex ratio manipulation for insect population control. **Papathanos PA**, Windbichler N and Akbari OS; in Transgenic Insects - techniques and applications CABI, 29 Oct 2014 pages 83-100

Grants, Fellowships and Awards

2010–13	EMBO outgoing postdoctoral fellowship
2013–14	Marie Curie incoming postdoctoral fellowship
2013–18	Coordinated Research Grant: IAEA Title: Explore mechanical, molecular, behavioural or genetic methods of sex separation in mosquitoes Role: Principal Investigator at UNIPG
2014–17	Young researchers career development fellowship: Rita Levi Montalcini, Italian Ministry of Education Title: Dissecting the genetic mechanism of sex determination during embryogenesis in the malaria mosquito <i>Anopheles gambiae</i> Role: Principal Investigator at UNIPG
2016–20	Research Grant: Grand Challenges in Global Health Initiative, Bill and Melinda Gates Foundation grant to Target Malaria Project led by Austin Burt Title: Controlling mosquito vectors of malaria with engineered endonucleases Role: Co-Principal Investigator at UNIPG
2017–20	Research Grant: Biology and Biotechnology Research Council, UK led by Nikolai Windbichler Title: The universal X-shredder: Enabling genetic control by sex ratio distortion in agricultural pests and disease vectors Role: Project Partner at UNIPG
2019	Golda Meir Fellowship Hebrew University of Jerusalem
2019–24	Coordinated Research Grant: IAEA Title: Generic approach for the development of genetic sexing strains (GSS) for SIT applications. Role: Principal Investigator at HUJI

Teaching Experience

- 2005–09 Teaching Assistant in Molecular Parasitology
Imperial College of London
- 2014 Lectures in Bioinformatics Introductory Course (October 23)
Course Organiser: PoloGGB
Location: University of Perugia
- 2014 Guest Lectures in synthetic biology and genetics (June 20)
Dottorato in Genetica, Biologia Molecolare e Cellulare
Corso di “Manipolazione dei Genomi”
University of Pavia
- 2015–16 Lectures in Applied Microbiology and Virology
Corso di Laurea triennale in Biotecnologie
University of Perugia
- 2017 Guest Lectures in postgraduate course synthetic biology and genetics (March 6)
University of Pavia
- 2016–17 Lectures in Applied Microbiology and Virology
Corso di Laurea triennale in Biotecnologie
University of Perugia
- 2019 Lecture on Insect Sex Determination
Insect Physiology
Hebrew University of Jerusalem

Participation in Research Consortia

- 2013–15 Anopheles genome consortium
Role: Thematic Analysis lead; Coordination and analysis of genomic data
- 2013–16 Tiger mosquito genome consortium
Role: Coordination and analysis of genomic data
- 2013–17 Evolution of sex biased genes in *Anopheles* mosquitoes
Role: Principal Investigator
- 2014–17 Mosquito Y-chromosome consortium
Role: Coordination of gene finding and lead on molecular genetics.
- 2013–18 Development of the Sterile Insect Technique for the control of disease transmitting mosquitoes
CRP of the IAEA
Role: Principal Investigator
- 2005–20 Target Malaria: Controlling mosquito vectors of malaria with engineered endonucleases
Role: Co-Principal Investigator with Roberta Spaccapelo UNIPG
- 2016– The universal X-shredder: Enabling genetic control by sex ratio distortion in agricultural pests
and disease vectors.
Role: Project partner and Group Leader

2019–24 Development of the Sterile Insect Technique for the control of disease transmitting mosquitoes
CRP of the IAEA
Role: Principal Investigator

Conferences

2007 3rd International Meeting on "Molecular and Population Biology of Mosquitoes and Other Disease Vectors", EMBO Conference, July 2007, Crete, Greece (Poster)

2008 The XXIII International Congress of Entomology, July 2008, Durban, South Africa (Talk)

2013 5th International Meeting on "Molecular and Population Biology of Mosquitoes and Other Disease Vectors", EMBO Conference, July 2013, Kolymbari, Crete, Greece (Talk)

2013 1st Co-ordinated Research Programme on Exploring mechanical, molecular, behavioural or genetic methods of sex separation in mosquitoes, Sep 2013 IAEA, Vienna (Talk)

2014 19th E-Sove Conference Oct 2014, Thessaloniki, Greece (Session Chair)

2015 2nd Co-ordinated Research Programme on Exploring mechanical, molecular, behavioural or genetic methods of sex separation in mosquitoes, Mar 2015, Moscamed, Brazil (Talk)

2016 The XXV International Congress of Entomology, Orlando, USA (Talk)

2016 3rd Co-ordinated Research Programme on Exploring mechanical, molecular, behavioural or genetic methods of sex separation in mosquitoes, Oct 2016, Mexico (Talk)

2017 EMBO Conference on vector and disease control July 2017, Kolymbari, Crete, Greece (Poster and Chair gene drive and engineering)

2018 Entomological Society of Israel, Oct 2018, Rehovot, Israel (Talk)

Student Mentoring or co-mentoring

2013–16 Elisa Fiorentini (PostDoc)

2013–17 Alessia Cagnetti (PhD student – PostDoc)

2013–17 Rocco D'Amato (PostDoc)

2014–16 Salvatore Di Martino (Undergraduate)

2014–17 Francesco Papa (PhD student)

2018– Doron Zaada (PhD student)

2019– Flavia Krsticevic (PostDoc)

Invited Seminars

2016 LOEWE Center for Insect Biotechnology, Germany (Apr 6)

2016 Faculty of Agriculture, Food and Environment, Hebrew University, Israel (Apr 21)

2016 Volcani Centre, Israel (Apr 21)

2017	Department of Life Sciences, University of Naples, Italy (Jan 29)
2017	UN, International Atomic Energy Agency, Austria (Feb 27)
2017	Department of Genetics, University of Pavia and CNR, Italy (Mar 6)
2017	Department of Health Sciences, Ben Gurion University, Israel (Mar 15)
2017	Department of Life Sciences, University of Siena, Italy (Mar 21)
2017	Department of Health Sciences, Ben Gurion University, Israel (Jun 15)
2018	Department of Entomology, HUJI, Rehovot, Israel (Jan 3)
2018	HUJI Epigenetics and Gene Editing Club, HUJI, Rehovot, Israel (Jul 25)
2018	Evolutionary Biology Center, Uppsala University, Sweden (Sep 28)
2018	Institute of Evolution, Haifa University, Israel (Nov 20)
2019	Faculty of Agriculture, Food and Environment HUJI, Rehovot (Jan 30)
2019	Faculty of Medicine, Hebrew University of Jerusalem (Apr 15)