

## David DUNEAU, PhD

University Toulouse, Laboratory *Evolution Diversité Biologique* (France)

& Instituto Gulbenkian de Ciência (Portugal)

✉ : [david.duneau@gmail.com](mailto:david.duneau@gmail.com)

Languages: French (native); English (fluent); Portuguese (basic); R (fluent)

### Research interests

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My research asks *why individuals vary in their responses to environmental challenges* with a focus on the challenges imposed by parasites. I test evolutionary and ecological concepts in model invertebrates by integrating experimental approaches such as functional genetics with statistical modelling, genomics (GWAS), and transcriptomics.

- Host-parasite interaction ■ co-evolution ■ sexual dimorphism ■ phenotypic plasticity
- genetic basis of quantitative traits ■ within-host dynamics
- bacteria ■ *Drosophila*

### Research positions

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01/01/2020 to 31/10/2020 & 01/01/2021 to 30/06/2021:

**Independent researcher, *Laboratoire International Associé* programme**

Instituto Gulbenkian de Ciência, Portugal & University Toulouse 3, France.

01/04/2015 to 31/10/2017 & 01/09/2019 to 31/10/2019:

**Senior post-doctoral research associate**

Lab. Evolution and Biological Diversity (EDB) University Toulouse 3.

01/11/2011 – 22/12/2014:

**SNSF post-doctoral research associate**

Lazzaro Lab, Cornell University, USA.

### Career break

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01/11/2017 to 31/08/2019: ~2 years parental leave (1 child now 6 years old)

### Education

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2007 – 23/09/2011: **PhD student in Evolutionary parasitology** Basel Univ. (CH) (Sept 23, 2011)  
*'Evolutionary and proximate mechanisms shaping host-parasite interactions: The case of Daphnia magna and its natural bacterial parasite Pasteuria ramosa.'*

2004 - 2006: **Masters in Ecology and Evolutionary Biology**, Montpellier Univ. (FR)

2001 - 2004: **Bachelor of Science in Organismal Biology**, Montpellier Univ. (FR)

### Funding

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- Sponsored fellowships and postdoc funding (278K€)
  - Fellowship from Gulbenkian Foundation in Lisbon (2020 & 2021; 30K€)
  - Post-doctoral '*Prestigious and Marie Curie Fellowship*' (2017; 51K€)
  - Post-doctoral fellowship from LabEx TULIP (2015; 112K€)
  - Post-doctoral fellowship from Swiss NSF (2011 & 2013; 76K€)

- Fellowship from the Emilia Guggenheim-Schnurr foundation in Basel (2009; 9K€)
- Grants
  - PI David Duneau and Lucie Zinger: Disentangling the factors shaping gut microbiota diversity across arthropod predators (EDB Toulouse Univ. funded by LabEx CEBA; 2016; 20K€)
  - PI Jean-Baptiste Ferdy (Duneau D. co-PI, 15%-time allocation): Pathogens adaptation to their host's microbiome (EDB Toulouse Univ., funded by "New frontiers" LabEx TULIP project; 2016; 82K€)
  - PI Patrícia Beldade (Duneau D. co-PI, 20%-time allocation): Adaptive Developmental Plasticity: genetic and environmental components of phenotypic variation (FCT Portugal; 2016; 192K€)
- 5 Travel grants to attend conferences.

## Main scientific accomplishments

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My research has contributed to:

- **Parasite manipulating host behaviour** can escape from the predators (frog) of their host (Ponton *et al.* Nature 2006).
- Determining the mechanism responsible for the **coevolution between a host and its parasite** (Duneau *et al.* BMC Biol. 2011).
- Describing **sexual dimorphism in responses to infections** in *Drosophila* (Belmonte *et al.* Front. Imm. 2020) and uncovering **mechanisms driving dimorphism** (Duneau *et al.* BMC Biol. 2017).
- Proposing (Duneau & Ebert PLoS Biol. 2012), and demonstrating (Duneau *et al.* BMC Biol. 2012), that **parasites can adapt specifically to the sex of the host** they encounter the most often.
- Understanding the link between **within-host dynamics and infection outcome** (Duneau *et al.* eLife 2017, invited review in Current Opinion Insect Science 2022).
- Characterising the **genetic basis of insecticide resistance** (Duneau *et al.* G3 2018) and **phenotypic plasticity** (Lafuente *et al.* PLoS Gen. 2018, Bonfini *et al.* eLife 2021).
- Showing that the distinct **steps of infection impose trade-offs to bacterial within-host evolution** (Faucher *et al.* mBio 2020).
- Showing that **cancer can increase the risk of being predated** (Duneau *et al.* BioRxiv 2020).

## Academic leadership

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- **Reviewer for 20 Journals**
  - Animal Behaviour ■ Biology Letters ■ BMC Biology ■ BMC ecology ■ BMC Evolutionary Biology ■ Coevolution ■ Ecology and Evolution ■ Evolution ■ Epidemiology and Infection ■ Heredity ■ Invertebrate Biology ■ Invertebrate Survival Journal ■ Nature Communications ■ Oecologia ■ Oikos ■ Phil. Transactions of the Royal Society ■ PLoS ONE ■ PNAS ■ Proceedings of the Royal Society B ■ Journal of Animal Ecology.
- **Reviewer for 4 funding agencies**
  - Sigma Xi awards research grants program ■ National Commission for Scientific and Technological Research of Chile ■ National Fund for Scientific Research of Belgium (NFWO) ■ European Research Council (ERC).
- **Thesis committee and jury**
  - Examiner for Pinaud S at Univ. Perpignan (France) supervised by Gourbal B (2018)
  - Thesis committee Hanson M at EPFL (Switzerland) supervised by Lemaitre B (2018)

- **Administrative & organisational roles**

- Part of the scientific committee of the French Network "Réseau Ecologie des Interactions Durables" (REID) (2020-current).
- Organisation of the National meeting of the French Network "Réseau Ecologie des Interactions Durables" (REID) (2017, Museum natural history of Toulouse).
- Organisation of departmental seminars (2015 to 2017, University of Toulouse 3)
- Organisation of seminars aiming to present experiments or analyses before they were performed. (From fall 2009 to spring 2011, Zoological Institute Basel)

## Teaching

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- **Active learning grounded in evidence-based techniques of teaching**

- Evaluation in "*Evolutionary biology and genetics*" (2017 & 2018) Level: 3<sup>rd</sup> year undergraduate, University of Toulouse 3. We used a role play method to evaluate their understanding of concepts in evolutionary biology (example of questions: "What is death in an evolutionary biology context?", "What is the cost of sex?").
- Teaching assistant, practical in *Ecological and Evolutionary Genetics* (2009 and 2010). Level: Masters student, University of Basel. I developed exercises based on real examples and employed a "think – pair – share" method, where students *think* for themselves, exchange with their neighbour (*pair*) and *share* with the class.
- Teaching of *Introduction to biology* (2009). Level: group of ~10 1<sup>st</sup> year undergraduates, University of Basel. I put the students at the centre of the teaching by asking them to respond to a set of concept inventory questions before the lecture (at home) and, after having established the students who knew the answer, I asked those students to participate in the teaching by explaining concepts to their classmate.

- **Conventional**

- Numerous and continual participation in mock panels and presentation critique for PhD students approaching their defence.
- Invited lecture on host-parasite coevolution (2017). Level: high school teachers.
- Summer school LabEx TULIP (2015) on Integrative Ecology and Biology "Biological interactions from genes to ecosystems". Level: from 4<sup>th</sup> year undergraduates to Postdoc.
- Departmental workshop on statistical analysis of experimental data. Level: Postgraduates (2014).
- Tutor in student scientific projects (2008 to 2010). Level: 3<sup>rd</sup> year undergraduate, University of Basel.
- Teaching assistant, *practical of Animal Biology (Embryology)* with Prof. Louis Du Pasquier (2009). Level: 3<sup>rd</sup> year undergraduates, University of Basel.
- Teaching assistant, *practical of Animal Biology (Entomology)* with Prof. Dieter Ebert (2008). Level: 3<sup>rd</sup> year undergraduates, University of Basel

## Student supervision (1 thesis as co-supervisor, 3 Master 2, 12 undergrads)

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- **PhD student**

- Yara Santos Rodrigues *Regulation and evolution of developmental plasticity in insect pigmentation: temperature and immunity interactions*. (Co-supervision with Beldade P from Lisbon Univ.; 2015 - Oct. 2020)

- **Master 2 students**

- Lafont P *A stochastic model for estimating immune parameters from the infection dynamics of a pathogen.* (co-supervision with Ferdy JB (EDB, Toulouse Univ.); 2019)
- Lemoine M *Ecological and evolutionary determinants of gut microbial communities in predatory insects.* (Co-supervision with Zinger L (ENS Paris); 2017)
- Mazana V *Role of phenotypic switching in the division of labor during infection.* (2017)

- **Other undergraduate students**

■ Lafont P (2018) ■ Kardacz M (2017) ■ Mazana V (2016) ■ Kondolf H (2014, 2015) ■ Ortiz G (2013 - 2015) ■ Fox M (2012 - 2015) ■ Chow C (2013) ■ Edraki A (2013) ■ Ruder L (2010) ■ Eichin D (2009) ■ Gygli S (2009) ■ Hofer L (2009, 2010)

## Scientific communications

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- **Invited talks (18)**

### 2020:

- Seminar at the Institute of Biology - Zoology, Freie Universität Berlin, 11/2020 (online talk; invited by Olivia Judson, Jens Rolf and Sophie Armitage)
- Seminar New voices in Infection Biology, Max Planck Institute for Infection Biology, Berlin, 10/2020 (online talk; invited by Igor Iatsenko) **Recording at:** <https://youtu.be/e0N7eg-U0hI>
- Seminar at Department DGIMI, Montpellier University, 10/2020 (online talk; invited by Alain Givaudan)

### 2019 and before:

- Innsbruck University, Innsbruck, Austria- 11/2019 (talk; invited by Markus Möst)
- Edinburgh University, Edinburgh, UK - 06/2018 (talk; invited by Sarah Reece)
- EPFL, Lausanne, Switzerland -04/2018 (talk; invited by Bruno Lemaitre)
- University of Burgundy, Dijon, FR - 12/2017(talk; invited by Thierry Rigaud)
- University of Montpellier (SEEM), Montpellier, FR - 12/2017(talk; invited by Karen McCoy)
- Insect Biology Research Institute, Tours, FR - 10/2017 (talk; invited by Joel Meunier)
- CNRS, Gif-sur-Yvette, FR - 04/2016 (talk; invited by Frédéric Mery)
- Centre Biologie du Développement, Toulouse, FR - 04/2016 (talk; invited by Alain Vincent)
- Conference LabEx TULIP, Toulouse, FR - 03/2016 (talk; invited by Etienne Danchin)
- Institute for advanced study, Toulouse, FR - 06/2015 (talk; invited by Arnaud Togneti)
- Seminar at the Center for infectious disease dynamics, PennState University, University Park, PA, USA - 04/2014 (talk; invited by David Hughes)
- Seminar at the department of Evolution, Ecology and Genetics, Australian National University, Canberra, Australia - 02/2014 (talk; invited by Hanna Kokko).
- Seminar at the department of Ecology and Evolutionary Biology, Rochester University, Rochester, USA - 11/2013 (talk; invited by John Jaenike).
- Department of Evolutionary Biology of Cornell University, Ithaca, USA - 2012 (talk)
- Institute for Development Research (IRD), Montpellier, FR - 2010 (talk; invited by Karen McCoy)

- **Conferences (15)**

- Conference ESEB (2<sup>nd</sup> joint congress), Montpellier, FR - 08/2018 (Poster)
- Conference Jacques Monod "Open questions in ecology and evolution in infectious diseases: from fundamental research to evolutionary medicine" - Roscoff Biological Station, FR - 10/2017 (Poster)
- Conference Immuninv2017, Lyon, FR - 06/2017 (Contributed talk)
- REID Annual Conference, Poitiers, FR - 03/2016 (Contributed talk)
- Conference 15<sup>th</sup>ESEB, Lausanne, Switzerland - 08/2015 (Contributed talk)
- Conference Jacques Monod, "Infectious diseases as drivers of evolution: the challenges ahead" - Roscoff Biological Station, FR - 09/2014 (contributed talk)
- Drosophila research conference, San Diego, USA - 03/2014 (poster)
- Conference 14<sup>th</sup> ESEB, Lisbon, Portugal - 08/2013 (poster)
- Drosophila research conference, Washington DC, USA - 03/2013 (poster)
- Conference ESEB (joint congress), Ottawa, Canada - 08/2012 (contributed talk)
- Conference 13<sup>th</sup> ESEB, Tubingen, Germany - 08/2011 (contributed talk)
- Conference Swiss-Russian Seminar, Freiburg, Switzerland - 2010 (contributed talk)
- Conference 16<sup>th</sup> EMPSEB, Wierzba, Poland - 2010 (contributed talk)
- Conference 12 ESEB, Turin, Italy - 2009 (contributed talk)
- Conference 15<sup>th</sup> EMPSEB, Shoorl, Netherlands - 2009 (contributed talk)

## Scientific outreach

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- What is Covid? (2020) Talk for primary school kids and their parents, online USA & online Italy
- De Dinechin D, Deguine JP, **Duneau D** (2006) *L'Homme de Florès. La découverte d'une nouvelle espèce humaine*. **Annales de la Société d'Horticulture et d'Histoire Naturelle de l'Hérault** 146 : 38-45
- **Duneau D**, Deguine JP, De Dinechin M, Blondel J (2006) *L'homme de Flores. Nanisme et gigantisme insulaire*. **Annales de la Société d'Horticulture et d'Histoire Naturelle de l'Hérault** 146 : 57-66
- Deguine JP, De Dinechin M, **Duneau D** (2006) *L'Homme de Florès. L'évolution de l'Homme et Homo floresiensis*. **Annales de la Société d'Horticulture et d'Histoire Naturelle de l'Hérault** 146 : 87-94
- **Epidemiology Fact [Sheets](#)** *Mosquito Biology for the Homeowner*
- **Scientific documentary** (52min) « *Toto le nemato.* », Price Buffon 2008 « Festival Paris science »