

# Legros Mathieu, Ph.D.

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Date of birth: 10 Jan. 1981

Nationality: French

## CURRENT POSITION

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**Since Jul. 2011: Postdoctoral Scholar:** Evolution of drug resistance in malaria.

Theoretical Biology Group, ETH Zürich, Switzerland (Sebastian Bonhoeffer)

*Details:* - combination of between-hosts, within-host and within-vector modelling of multiple *Plasmodium* strains dynamics ;  
- impact of treatment on strain competition and disease transmission;  
- interactions between chemotherapy, vector ecology and vector control

## RESEARCH EXPERIENCE

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**2006-2011: Postdoctoral Research Associate:** Modelling *Aedes aegypti* population dynamics and genetic strategies of dengue.

North Carolina State University, Entomology Dpt., Raleigh, NC, USA. (Fred Gould, Alun Lloyd)  
University of California Davis, Entomology Dpt., Davis, CA, USA (Thomas Scott)

*Details:* - construction and development of biologically rich models of the population dynamics and population genetics of *Aedes aegypti*;  
- location-specific, field-informed model calibration and validation;  
- model-based assessment of control strategies based on the release of transgenic mosquitoes (population suppression and/or replacement).

**2001-2006: Ph.D. in Ecology:** Genotype x genotype interactions between hosts and parasites and coevolutionary consequences.

Laboratoire de Parasitologie Evolutive, CNRS UMR 7103, Univ. Paris VI, France. (Jacob Koella)

*Details:* - experimental evolution: cost of specialization of a microsporidian parasite *Brachiola algerae* to isofemale lines of its host *Ae. aegypti*;  
- theoretical study: spatially explicit model of the role of host-parasite interactions in the evolutionary maintenance of sexual reproduction.

**2001: Masters in Ecology:** Host-parasite interactions and evolutionary maintenance of sexual reproduction.

Laboratoire de Parasitologie Evolutive, CNRS UMR 7103, Univ. Paris VI, France. (Jacob Koella)

## EDUCATION

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**2001-2006: Ph.D. in Ecology**, Univ. Paris VI, France (Supervisor: Jacob Koella).  
Funding: "Allocation couplée", French Research Dpt.

**1998-2001: M.S. (Magistère) in Molecular and Cell Biology**

École Normale Supérieure de Lyon / Univ. Lyon I

Includes:

- **2000-2001: Masters 2 (DEA) in Ecology**, Univ. Paris VI
- **1999-2000: Masters 1 (Maîtrise) in Ecosystems and Population Biology**,  
École Normale Supérieure Lyon – Univ. Lyon I
- **1998-1999: B.S. (License) in Cell Biology and Physiology**,  
École Normale Supérieure Lyon – Univ. Lyon I

**1996-1998: Classes préparatoires BCPST** (biology, chemistry, physics, geology)  
Lycée Michel Montaigne, Bordeaux, France.

## TEACHING AND SUPERVISING

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**2010-2011: Advisor**, Masters project, Computer Science (GUI development)  
North Carolina State University, Raleigh, NC, USA.

**2005-2006: Assistant Lecturer (ATER)**

Université de Picardie Jules Verne, Amiens, France

*Undergraduate*: ecology, evolutionary biology, zoology, cell biology;

*Graduate*: population biology, interspecific interactions.

**2003: Co-advisor**, Masters project, experimental evolution of specialization  
Université Paris VI, France.

**2002-2005: Teaching Assistant (Moniteur)**

Université Paris VI, France.

*Undergraduate*: ecology, evolutionary biology, biogeography, population biology, zoology;

*Graduate*: parasitology.

**Additional teaching:**

**2011-2016: ETH Zürich**, Switzerland: semester project tutoring (Masters), literature search and review article writing;

**2006-2011: North Carolina State University, USA**: graduate seminar classes on genetic pest control, literature review and presentations.

## PUBLICATIONS AND COMMUNICATIONS

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### Articles published or accepted in peer reviewed journals:

(\*: equal author participation)

- [16-2] **Legros M.\***, Otero M.\*, Aznar V.R., Solari H., Gould F., Lloyd A.L. (2016) Comparison of two detailed models of *Aedes aegypti* population dynamics. *Ecosphere* 7(10): e01515.
- [16-1] **Legros M.**, Bonhoeffer S. (2016) Evolution of resistance to antimalarial drugs: a combined within-host and between-hosts modelling framework. *J. Roy. Soc. Interface*, 13:20160148.
- [13-1] **Legros M.**, Xu C., Morrison A.C., Scott T.W., Lloyd A.L., Gould F. (2013) Modeling the dynamics of a non-limited and a self-limited gene drive system in structured *Aedes aegypti* populations. *PLoS One* 8(12): e83354.
- [12-3] **Legros M.**, Xu C., Okamoto K., Scott T.W., Morrison A.C., Lloyd A.L., Gould F. (2012) Assessing the feasibility of controlling *Aedes aegypti* with transgenic methods: A model-based evaluation. *PLoS One* 7(12): e52235.
- [12-2] Padmanabha H., Correa F., **Legros M.**, Nijhout H.F., Lord C. & Lounibos L.P. (2012) An eco-physiological model of the impact of temperature on *Aedes aegypti* life history traits. *J. Insect Physiol.* 58(12): 1597-1608.
- [12-1] Robert M.A., **Legros M.**, Facchinelli L., Valerio L., Ramsey J.M., Scott T.W., Gould F. & Lloyd A.L. (2012) Mathematical models as aids for design and interpretation of experiments: The case of transgenic mosquitoes. *J. Med. Entomol.* 49(6): 1177-1188.
- [11-2] **Legros M.**, Magori K., Morrison A.C., Xu C., Scott T.W., Lloyd A.L. & Gould F. (2011) Evaluation of location-specific predictions by a detailed simulation model of *Aedes aegypti* populations. *PLoS One* 6(7): e22701.
- [11-1] Huang Y., Lloyd A.L., **Legros M.** & Gould F. (2010) Gene-drive into insect populations with age and spatial structure: a theoretical assessment. *Evol. Appl.* 4(3): 415-428
- [10-3] Xu C., **Legros M.**, Gould F. & Lloyd A.L. (2010) Understanding uncertainties in model-based predictions of *Aedes aegypti* population dynamics. *PLoS Negl. Trop. Dis.* 4(9): e830.
- [10-2] **Legros M.** & Koella J.C. (2010) Experimental evolution of specialization by a microsporidian parasite. *BMC Evol. Biol.* 10: 159.
- [10-1] Jongsma M.A., Gould F., **Legros M.**, Yang L., van Loon J.J.A. & Dicke M. (2010) Insect behavior affects the evolution of adaptation to *Bt* crops: consequences for refuge policies. *Evol. Ecol.* 24(5): 1017-1030.
- [09-3] **Legros M.**, Lloyd A.L., Huang Y. & Gould F. (2009) Density-dependent intraspecific competition in the larval stage of *Aedes aegypti* (Diptera: Culicidae): Revisiting the current paradigm. *J. Med. Entomol.* 46(3): 409-419.

- [09-2] Magori K.\*, **Legros M.\***, Puente M., Focks D.A., Scott T.W., Lloyd A.L. & Gould F. (2009) Skeeter Buster: a stochastic, spatially-explicit modeling tool for studying *Aedes aegypti* population replacement and population suppression strategies. *PLoS Negl. Trop. Dis.* 3(9): e508.
- [09-1] Huang Y., Lloyd A.L., **Legros M.** & Gould F. (2009) Gene drive in age-structured populations. *Evol. Appl.* 2(2): 143-159.
- [08-1] Gould F., Huang Y., **Legros M.** & Lloyd A.L. (2008) A killer-rescue system for self-limiting gene drive of anti-pathogen constructs. *Proc. R. Soc. B* 275: 2823-9.
- [00-1] Fournel S., Huc X., Aguerre-Gire M., Solier C., **Legros M.**, Praud-Brethenou C., Moussa M., Chaouat G., Berrebi A., Bensussan A., Lenfant F. & Le Bouteiller P. (2000) Comparative reactivity of different HLA-G monoclonal antibodies to soluble HLA-G molecules, *Tissue Antigens*, 55(6): 510-8.

Communications – Conference presentations:

- [16-3] **Legros M.**, Bonhoeffer S. (2016) Within-vector factors and evolution of resistance to antimalarial drugs. *VectorBiTE 2016 RCN meeting*, Clearwater, FL, USA.
- [14-2] **Legros M.**, Bonhoeffer S. (2014) Evolution of resistance to antimalarial drugs: the importance of vector factors. *Entomological Society of America Annual Meeting*, Portland, OR, USA
- [14-1] **Legros M.**, Bonhoeffer S. (2014) A between-hosts and within-host combined modeling framework for the evolution of resistance to antimalarial drugs. *American Society of Tropical Medicine and Health Annual meeting*, New Orleans, LA, USA (poster)
- [13-2] Otero M., **Legros M.**, Romeo Aznar V., Solari H., Scott T.W., Gould F. & Lloyd, A.L. (2013) Comparison of two stochastic spatial dynamical models of *Aedes aegypti*. *Latin American Workshop on Nonlinear Phenomena*, Córdoba, Argentina.
- [12-5] **Legros M.**, Bonhoeffer S. (2012) Evolution of drug resistance in malaria parasites. *American Society of Tropical Medicine and Health Annual meeting*, Atlanta, GA, USA (poster)
- [12-4] **Legros M.**, Bonhoeffer S. (2012) Evolution of drug resistance in malaria parasites. *Challenges in Malaria Research: Progress towards Elimination*, Basel, Switzerland (poster)
- [11-3] **Legros M.**, Otero M., Solari H., Scott T.W., Gould F. & Lloyd A.L. (2011) Comparison of two spatial models of *Aedes aegypti* population dynamics. *American Society of Tropical Medicine and Health Annual meeting*, Philadelphia, PA, USA (poster)

- [09-5] **Legros M.**, Magori K., Xu C., Morrison A.C., Scott T.W., Lloyd A.L. & Gould F. (2009) Modeling the suppression of *Aedes aegypti* population using releases of transgenic mosquitoes with conditional female lethality. *American Society of Tropical Medicine and Health Annual meeting*, Washington, DC, USA (poster)
- [09-4] Xu C., **Legros M.**, Gould F. & Lloyd A.L. (2009) Understanding uncertainties in equilibrium population dynamics of *Aedes aegypti*: a model-based analysis. *American Society of Tropical Medicine and Health Annual meeting*, Washington, DC, USA (poster)
- [08-2] Williams C.R., Johnson P.H., **Legros M.**, Magori K., Lloyd A., Gould F., Ritchie S. A. (2008) Use of *Aedes aegypti* population models for simulating crop size and gene flow, *Arbovirus Research in Australia*
- [05-1] **Legros M.** & Koella J.C. (2005) Experimental specialization of a microsporidian parasite to its mosquito host. *Xe ESEB meeting*, Krakow, Pologne (poster)
- [03-1] **Legros M.** & Koella J.C. (2003) Etude expérimentale de la spécialisation dans un système hôte parasite. *26e « Petit pois déridé »*, Toulouse, France
- [02-1] **Legros M.** & Koella J.C. (2001) Leaving some space to the Red Queen: the maintenance of sex in a spatial context. *8th meeting of PhD students in Evolutionary Biology*, Lohja, Finlande.

Thesis:

- [06-1] **Legros M.** (2006) Interactions génotypiques entre hôtes et parasites et conséquences coévolutives.  
Université Pierre et Marie Curie Paris VI, Paris, France (in French).

OTHER

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- Languages:** French: native  
English: fluent  
German: A2 level
- Programmation:** C/C++, python, MATLAB, HTML/CSS
- Peer review:** *PLoS Biology*, *Proc. Roy. Soc. Lond. B.*, *J. R. Soc. Interface*, *Malaria J.*, *J. Med. Entomol.*, *J. Theor. Biol.*, etc.
- Memberships:** American Society of Tropical Medicine and Health  
Entomological Society of America  
VectorBite Research Coordination Network