

Guilhem Doulcier | PhD Student

Ecology, Evolution and Applied Mathematics

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Education

Thèse de doctorat (PhD) **2016–2019**
Paris Sciences et Lettres University *Paris, France*

A three year PhD program supervised by Paul B. Rainey (ESPCI Paris/MPI Plön), Silvia De Monte (IBENS) and Amaury Lambert (Sorbone University/Collège de France). This project is funded as part of the Origins of Life program in PSL university and monitored by the Frontières du Vivant program in CRI (Paris). Defence on the 2nd of December, 2019.

M2 Mathématiques et applications **2015–2016**
Université Pierre et Marie Curie *Paris, France*
Second year of a master degree in applied mathematics (Biology Modeling curriculum).

Diplôme de l'École normale supérieure **2012–2016**
École normale supérieure *Paris, France*
Major in Biology, Minor in environmental sciences.

M1 Écologie-Biodiversité-Évolution **2013–2014**
École normale supérieure *Paris, France*
First year of a master degree in Ecology, Biodiversity and Evolution.

Licence de Biologie **2012–2013**
École normale supérieure *Paris, France*
Bachelor Degree in Life Science

Classe préparatoire aux grandes écoles **2010–2012**
Lycée Joffre *Montpellier, France*
Section Biologie Chimie Physique et Sciences de la Terre.
A 2-year intensive program in biology, physics, chemistry and earth science preparing for the national competitive exam for entry to engineering schools.

Baccalauréat scientifique, spécialité physique chimie **2007–2010**
Lycée André Chamson *Le Vigan, France*
High-school national diploma in science, physics and chemistry specialization.

Work Experience

Scientist **2019**
Max Plank Institute for Evolutionary Biology *Plön, Germany*

Short term research contract (3 month), based in the evolutionary theory department in MPI Plön where I have several scientific collaborations ongoing.

Consultant and Developer **2016-2018**
Millidrop Instrument SAS *Paris, France*

I am hired by the Millidrop Instrument startup as a consultant and developer to build data analysis software for their flagship "Millidrop Analyzer".

Studying collective heredity: theoretical foundations and practical solutions **2016**
ESPCI Paris - Université Paris Sciences et Lettres *Paris, France*

A six month research project involving the modeling of the emergence of Darwinian characteristic at the collective level and the development of a signal processing and visualization pipeline for the high throughput phenotype analyzer developed by the Millidrop start-up. Project supervised by Paul B Rainey (ESPCI Paris), Silvia De Monte (ENS) and Amaury Lambert (Collège de France).

Structure of natural bipartite networks **2015**
Stouffer Lab - University of Canterbury *Christchurch, New-Zealand*

A six month research project combining theoretical tools development, implementation, and application about the structure of plant-pollinator networks and their consequences. Project supervised by Daniel Stouffer.

Impact of climate change and land use on meta-communities **2014-2015**
Équipe Biodicée - Institut des Sciences de l'Évolution de Montpellier *Montpellier, France*

A five month research project combining spatiotemporal modeling and data analysis, supervised by Sonia Kéfi and Vincent Devictor, about the impact of environmental and climatic variation on metacommunity composition.

Automatic taxonomic affiliation in viral metagenomic data **2014**
Tucson Marine Phage Lab - University of Arizona *Tucson, United-States*

A five month research project supervised by Matthew Sullivan, about the automatic classification of the vast amount of viral sequence data gathered by the TARA expedition.

Adaptive Evolution of Cell Adhesion in Microbes **2013**
Éco-Évolution mathématique, Institut de Biologie de l'École normale supérieure *Paris, France*

Supervised by Silvia De Monte, two month research project on the evolution of multicellularity using adaptive dynamics.

Short lab internship.....

- o **2012** : *Institut de Biologie de l'École normale supérieure, Paris (France)*, Two weeks internship on the secondary structure of the non-coding snRNA 7sk supervised by Anne-Catherine Dock-Bregeon in the "Cell biology of transcription" team of Olivier Bensaude.

- **2011** : *Centre d'Écologie Fonctionnelle et Évolutive, Montpellier (France)*, Ten days in the team of Claude Grison on phytotechnology and green chemistry in the Natural Substances and Chemical Mediations team, Interaction, Ecology and Society Department.
- **2006** : *Institut de Radioprotection et de Sécurité Nucléaire, Cadarache (France)*, One week with Yann Monerie in the combustible study laboratory.

Teaching.....

- **2016-2019**: *Département de Biologie - École normale supérieure (Paris)*, I have a TA position for several lectures including "General computer science and unix" (L3), "Advanced Python programming" (L3) and "Mathematics for Biologists" (L3), "Modelling biological systems" (L3) as well as Adaptive Dynamics (M2).
- **2017**: *Kalvi Institute for Theoretical Physics, (Santa Barbara, CA)*, I was a TA in the summer school "Eco-evolutionary dynamics of microbial community" as part of the Santa Barbara Research School for Quantitative Biology.
- **2013-2015**: *Groupe de travail mathématiques et biologie - École normale supérieure (Paris)*, I gave the presentation about unsupervised classification in the "Mathematics and Biology" (2013) student work-group, I co-organized the "Game theory" workshop (2014). I also gave a lecture about the mathematics behind ecological niches (2015) and functional equations (2016).

Fundings.....

- **2016** : *Origines et conditions d'apparition de la vie program - Paris Sciences et Lettres Research University*, I obtained a three years PhD funding.
- **2016** : *Concours de l'École doctorale Science du Végétal - Université Paris-Saclay*. I obtained a three years PhD funding which I turned down.

Scientific Communication

- Presentation — **Mathematical Models In Ecology and Evolution 2019**, Lyon (France).
- Poster — **Gordon Research Conference on Microbial Population Biology 2019**, Andover (NH, USA).
- Presentation — **MPI workshop: Breathing Life into Chemistry**, 2019, Plön (Germany).
- Presentation — **MPI workshop: Evolutionary emergence of life cycles**, 2018, Plön (Germany).
- Presentation — **Evolution 2018**, Montpellier (France).
- Poster — **Evolution of Diversity Workshop**, Les Houches, 2018 (France).
- Presentation — **Models In Ecology and Evolution, 2017**, Montpellier (France).

Publications

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- **Eco-evolutionary dynamics of nested Darwinian populations and the emergence of community-level heredity** — Guilhem Doucier, Amaury Lambert, Silvia De Monte, Paul B. Rainey, *bioRxiv*, 2019.
- **Experimental manipulation of selfish genetic elements links genes to microbial community function** — Steven D. Quistad, Guilhem Doucier, Paul B. Rainey, *bioRxiv*, 2019.
- **Aridity leads to shifts in microbial communities and severe implications under a chang-**

ing climate — Manuel Delgado-Baquerizo, Guilhem Doulcier, David J. Eldridge, Daniel Stouffer, Fernando T. Maestre, Noah Fierer, Jeff. R. Powell, Thomas C. Jeffries, Brajesh K. Singh, *Land Degradation Development*, 2019.

- **A General framework to assess species contribution to community changes** — Pierre Gausere*, Guilhem Doulcier*, Vincent Devictor, Sonia Kefi, *Ecological Indicators*, 2019, (* These authors contributed equally to this work).
- **VConTACT: An IVirus Tool to Classify Double-Stranded DNA Viruses That Infect Archaea and Bacteria** — Benjamin Bolduc, Ho Bin Jang, Guilhem Doulcier, Zhi-Qiang You, Simon Roux, and Matthew B. Sullivan. *PeerJ*, 2017.
- **The evolution of adhesiveness as a social adaptation** — Thomas Garcia*, Guilhem Doulcier*, Silvia De Monte, *eLife*, 2015, (* These authors contributed equally to this work).
- **Patterns and ecological drivers of ocean viral communities** — Jennifer R. Brum*, J. Cesar Ignacio-Espinoza*, Simon Roux*, Guilhem Doulcier, Silvia G. Acinas, Adriana Alberti, Samuel Chaffron, Corinne Cruaud, Colomban de Vargas, Josep M. Gasol, Gabriel Gorsky, Ann C. Gregory, Lionel Guidi, Pascal Hingamp, Daniele Iudicone, Fabrice Not, Hiroyuki Ogata, Stéphane Pesant, Bonnie T. Poulos, Sarah M. Schwenck, Sabrina Speich, Celine Dimier, Stefanie Kandels-Lewis, Marc Picheral, Sarah Searson, Tara Oceans Coordinators, Peer Bork, Chris Bowler, Shinichi Sunagawa, Patrick Wincker, Eric Karsenti, Matthew B. Sullivan, *Science*, May 2015. (* These authors contributed equally to this work)

Skills

- **Languages:** French (mother tongue), English (fluent).
- **Computer programming:** Python (Numpy, Matplotlib, Pandas), C (HPC with OpenMP).
- **Computer software:** R, Parallel computing with grid engines, Unix tools, GNU/Linux system administration.
- **Web developpment:** HTML/CSS, SQL, Javascript (Data visualisation with D3js).
- Driver's licence

Community involvement

- **We Are Ready Now:** Developer on the project to follow the ratification of the 2016 Paris Agreement on climate change.
- **Association Écocampus ENS :** (*President for the year 2013*), Environmental association of ENS students.
- **Club CPN en pays vignais :** (*President from 2011 to 2012*), Naturalist and DIY straw bale house building association.