

Dear All,

I announce a PhD position in evolutionary genomics on **recombination and plant genome evolution** to work with me at the ECOBIO lab in Rennes (<https://ecobio.univ-rennes1.fr>).

The project is already funded but the candidates will have to take the EGAAL doctoral school contest (<https://ed-egaal.u-bretagne.fr/en>).

The project is detailed in the appended pages below.

Please do not hesitate to contact me for further information!

Best regards,

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Sylvain Glémin
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PhD PROPOSAL FOR THE DOCTORAL SCHOOL « Ecologie, Géosciences, Agronomie, ALimentation »

GENERAL INFORMATION

Thesis title: Recombination landscapes and plant genome evolution
Acronym: RecGenEvol
Disciplinary field 1: Ecology Disciplinary field 2: Select an element
Three keywords: Bioinformatics, evolutionary genomics, recombination
Research unit : ECOBIO UMR 6553
Name of the thesis director: Glémin Sylvain Email address of the thesis director : sylvain.glemin@univ-rennes1.fr Name of the thesis co-supervisor 1 (if applicable): Email address of the thesis co-supervisor 1 (if applicable): Name of the thesis co-supervisor 2 (if applicable): Email address of the thesis co-supervisor 2 (if applicable):
Thesis grant (funding origin and amount): Doctoral grant President / 117000€
Contact(s) (mailing address and E-mail): Sylvain Glémin, UMR 6553 ECOBIO, Université de Rennes 1, Campus de Beaulieu, bat. 14A, 35042 RENNES CEDEX
Recruitment process: Recruitment process depends on thesis funding. To select the corresponding recruitment process, please visit the EGAAL website here . This information is needed for proposal publication. <input checked="" type="checkbox"/> Doctoral school contest <input type="checkbox"/> Interview <input type="checkbox"/> Other (indicate) :

All sections must be filled. Once filled, please save the proposal form in pdf format using the following naming: Supervisor Name_Unit_Subject Acronym_EN.pdf

ED EGAAL

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SCIENTIFIC DESCRIPTION OF THE PhD PROJECT

Socio-economic and scientific context : (10 lines)

Recombination is a central mechanism of eukaryote's life cycle. It allows genetic mixing during meiosis, which create new genetic combinations every generations, increasing genetic diversity and the efficacy of selection. Recombination also has local molecular consequences as the very chromosomal position where it occurs, as it involves DNA break and repair mechanisms. In many species, these repair mechanisms are biased towards G and C nucleotides, which leads to apparent selection for GC (aka GC-biased gene conversion, gBGC). gBGC enriches genome in G and C and can counteract natural selection. Characterizing recombination patterns and their consequences is thus crucial to understand genome evolution and how species respond to selection and adapt to their environment. Flowering plants offer a high variation in genomic characteristics: genome size, number of chromosomes, recombination rate, GC content. However, despite these striking variations, the study of base compositions is rather recent compared to animal species and recombination patterns have been characterized in a handful of plant species only.

Assumptions and questions (8 lines)

The working hypothesis of the project is that variations in recombination patterns contribute to genomic diversity for genetic diversity, selection efficacy and base composition. More precisely:

- Is GC content higher in highly recombining species and genomic regions?
- Does recombination increase genetic diversity and the efficacy of selection?
- Do these effects vary among species at the flowering plant scale?

The main steps of the thesis and scientific procedure (10-12 lines)

- 1) Characterizing recombination landscapes in many plant species
- 2) Analyzing the effects of recombination on base composition
- 3) Analyzing the effect of recombination on genetic diversity and selection efficacy

Methodological and technical approaches considered (4-6 lines)

Comparative approach in more than 50 species representing the major groups of flowering plant phylogeny using publicly available data: full genome sequences, genetic maps, polymorphism data (from full genome resequencing data). Bioinformatics approach, comparative and population genomics and statistics (construction of recombination map, characterisation of GC content and polymorphism patterns, inference of gBGC and selection).

Scientific and technical skills required by the candidate

Knowledge in molecular evolution/evolutionary genomics/population genetics

Bioinformatics or skills in programming, statistics.

THESIS SUPERVISION¹

Unit name: ECOBIO UMR6553	Team name: EGA (Evolution, Génome, Adaptation)
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¹ In EGAAL Doctoral School, if only one scientist in thesis supervision = 100% of supervision rate; if 2 people involved in thesis supervision = from 50% to 70% of supervision rate for the director; if 3 people involved in thesis supervision = 40% / 30% / 30% of supervision rate distribution among supervisors.

Unit director name: Joan van Baaren	Team director name: Malika Ainouche
Mailing address of the unit director: joan.van-baaren@univ-rennes1.fr	Mailing address of the team director: malika.ainouche@univ-rennes1.fr
Thesis director Surname, first name: Glémin, Sylvain Position: Research director Obtained date of the HDR (Habilitation thesis to supervise research): 2009 Employer: CNRS Doctoral school affiliation: EGAAL Rate of thesis supervision in the present project (%): 100 Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%): 0 Number of current thesis supervisions/co-supervisions: 0	
Thesis co-supervisor 1 (if applicable) Surname, first name: Position: Habilitation thesis to supervise research <input type="checkbox"/> yes <input type="checkbox"/> no If yes, date diploma received: Employer: Doctoral school affiliation: Rate of thesis supervision in the present project (%): Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%): Number of current thesis supervisions/co-supervisions:	
Thesis co-supervisor 2 (if applicable) Surname, first name: Position: Habilitation thesis to supervise research <input type="checkbox"/> yes <input type="checkbox"/> no If yes, date diploma received: Employer: Doctoral school affiliation: Rate of thesis supervision in the present project (%): Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%): Number of current thesis supervisions/co-supervisions:	
Private partner (if CIFRE funding, private funding,...)	

Surname, first name:

Position:

Employer:

Rate of thesis supervision in the present project (%):

Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%):

Number of current thesis supervisions/co-supervisions:

International partner (if Cotutelle thesis)

Surname, first name:

Position:

Employer:

Rate of thesis supervision in the present project (%):

Total rate of thesis supervision in ongoing theses (supervisions and co-supervisions) (%):

Number of current thesis supervisions/co-supervisions:

Professional status of previous PhD students supervised by both director and co-supervisors (from 5 years)

Please provide the following information for each PhD students supervised

Surname, first name: Noël, Elsa

Date of PhD beginning and PhD defence: 2012-2015

Thesis supervision: Philippe Jarne / Sylvain Glémin (30%)

Professional status and location: Post-Doc INRA Montpellier

Contract profile (post-doc, fixed-term, permanent): Post-Doc

List of publications from the thesis work: Noel, E., Chemtob, Y., Janicke, T., Sarda, V., Pelissie, B., Jarne, P. et al. (2016). Reduced mate availability leads to evolution of self-fertilization and purging of inbreeding depression in a hermaphrodite. *Evolution*, 70, 625-640.

Noel, E., Jarne, P., Glémin, S., MacKenzie, A., Segard, A., Sarda, V. et al. (2017). Experimental Evidence for the Negative Effects of Self-Fertilization on the Adaptive Potential of Populations. *Curr. Biol.*, 27, 237-242.

Five main recent publications of the supervisors on thesis subject:

Clement, Y., Sarah, G., Holtz, Y., Homa, F., Pointet, S., Contreras, S. et al. and **Glémin S.** (2017). Evolutionary forces affecting synonymous variations in plant genomes. *PLoS Genet.*, 13, e1006799.

Wallberg, A., **Glémin, S.** & Webster, M.T. (2015). Extreme recombination frequencies shape genome variation and evolution in the honeybee, *Apis mellifera*. *PLoS Genetics*, 11, e1005189.

Glémin, S., Arndt, P.F., Messer, P.W., Petrov, D., Galtier, N. & Duret, L. (2015). Quantification of GC-biased gene conversion in the human genome. *Genome Res.*, 25, 1215-1228.

Glémin, S., Clement, Y., David, J. & Ressayre, A. (2014). GC content evolution in coding regions of angiosperm genomes: a unifying hypothesis. *Trends Genet.*, 30, 263-270.

THESIS FUNDING

Origin(s) of the thesis funding: President grant UR1
Gross monthly salary: 2135€
Thesis funding state: Obtained
Funding beginning date/Funding ending date: 01/10/2019 – 3 years

Date: 01/04/2019

Name, signature of unit director: Joan van Baaren

Name, signature of team director: Malika Ainouche

Name, signature of thesis project director: Sylvain Glémin