

## Job offer: postdoctoral Fellow

**Important note:** Some angles of the offer still have to be validated, they bear the mention [to be confirmed]. There will be regular updates of the job description.

**Project Title:** Statistical dosage for allelic detection and pedigrees reconstruction for different ploidy levels.

**Research Fields:** Applied mathematics, Probability and Statistics, Vegetal biology, Genetics.

**Work Place:** Angers (France).

**Research Laboratory(ies):** LAREMA and IRHS.

**UBL Research Department:** NUMERIC and AAL.

**Head(s) of the Scientific Project:** Fr d ric Proia (LAREMA) and J r my Clotault (IRHS).

**Offer type:** Postdoctoral researcher (12 months).

**Hiring Institution:** University of Angers.

**Application deadline:** 30<sup>th</sup> September 2017.

**Job Starting Date:** End of November 2017. **[to be confirmed]**

## Environment

The University of Angers trains more than 22,000 students (a number in continuous growth since 2001), employs around 1,000 teachers, offers more than 400 certificates and handles 8 doctoral schools. It is a multidisciplinary public establishment, the trainings are mainly related to sciences, law and economics, health as well as languages and humanities.

The LAREMA is the Mathematics Research Laboratory of Angers. It is a Mixed Unity of Research (UMR 6093), under the supervision of the CNRS and the University of Angers, which exists since about twenty years. The LAREMA is also a member of the CNRS Federation of Mathematics in Pays de la Loire (FR 2962), which gathers the mathematics laboratories of the Universities of Nantes, Angers and Le Mans. Besides, it is a partner of the Henri Lebesgue Center, a mathematics research and formation Labex in Bretagne and Pays de la Loire, having strong interdisciplinary connections.

The Research Institute of Horticulture and Science (IRHS) gathers the main actors of the plant science of Angers. Its 235 members are from the research institute INRA and the education and research institutes University of Angers and Agrocampus Ouest. The main research thematic are roses and other ornamentals, quality and health of pome fruits and vegetables, and seeds, stress and pathogens. These thematic are studied by an interdisciplinary approach merging genetics, genomics, breeding,

pathology, physiology, biochemistry, ecophysiology, modelling, bioinformatics and statistics. The Institute is a driving force for the international plant cluster Végépolys.

The project is incorporated within the framework of a collaboration between both laboratories: it concerns probability and statistics for genetic data exploitation (from rosebushes). In particular, the statistical detection and dosage of alleles through signals and the probabilistic pedigrees reconstruction of the population are at the heart of the project. A first approach is under development: an expert assessment and a significant improvement will be expected.

## Mission (scientific project)

In order to strengthen our knowledge on the rosebush heredity mechanisms, we have at our disposal a set of signals from microsatellite markers on DNA fragments of more than 2,000 individuals. On the one hand, we want to deduce the most likely genotype for each individuals, and on the other hand, our objective is the (probabilistic) reconstruction of the genealogy of the population. The process is cross-disciplinary between mathematicians and biologists. Intrinsically, the allelic composition is not sufficient to fully describe the genotype of an individual, as plants do not necessarily contain pairs of chromosomes. In particular, our population includes diploids, but also tri-, tetra-, penta- and hexaploids. For example, the detection of a couple of alleles for a triploid rose may lead to 'AAB' or 'ABB' genotypes, and combinatorial complexity increases with ploidy level. An allelic dosage on the signals, via an in-depth statistical study, is the first major axis of the project. This will improve the reconstruction of the genealogy, since a dosage contains a better information on the individual ancestry than the only allelic presence or absence. The second major axis consists in developing a probabilistic reconstruction of the genealogy taking this dosage into account. This amounts to finding in a compatible subpopulation the most likely couple of parents for each individuals. These new approaches will be useful to the community of geneticists of polyploid species, which are commonplace among plants. Pedigrees will also arouse the interest of plants creation companies, aiming to rationalise their future cross-breeding.

## Required Profile

Doctor (PhD) in applied mathematics (with specialization in probability and statistics), maximum 3 years of experience after thesis defense<sup>1</sup>. An international experience in research is required (during or after Doctorate). Candidates must not have supported their thesis in the hiring institution and not previously worked in the host research unit.

The recruited candidate will have solid experience in statistics (theoretical as well as applied), an extensive knowledge of the R programming language, in-depth skills in probability and an interest in interdisciplinarity, especially for genetics.

## Useful References

University of Angers : <http://www.univ-angers.fr/fr/index.html>

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1 The thesis defense must have taken place after 31/08/2014, except in rare exceptions. Periods of sickness, maternity or parental leave shall not be counted in this 3 years period.

LAREMA : <http://recherche.math.univ-angers.fr/>

IRHS : <http://www6.angers-nantes.inra.fr/irhs>

Some publications related to the topic :

- L. Chaumont, V. Malécot, R. Pymar, C. Sbai. *Reconstructing pedigrees using probabilistic analysis of ISSR amplification*. J. Theor. Biol. 412 (2017), 8–16.
- C. Zheng, M. Kuhner, E. Thompson. *Joint inference of identity by descent along multiple chromosomes from population samples*. J. Comput. Biol. 21 (2014), 185–200.
- C. Glazner, E. Thompson. *Improving pedigree-based linkage analysis by estimating coancestry among families*. Stat. Appl. Genet. Mol. Biol. 11 (2012), 1–17.
- G. D. Esselink, H. Nybom, B. Vosman. *Assignment of allelic configuration in polyploids using the MAC-PR (microsatellite DNA allele counting—peak ratios) method*. Theor. Appl. Genet. 109 (2004), 402–408.
- M. Liorzou, A. Pernet, S. Li, A. Chastellier, T. Thouroude, G. Michel, V. Malécot, S. Gaillard, C. Briée, F. Foucher, C. Oghina-Pavie, J. Clotault, A. Grapin. *Nineteenth century French rose (*Rosa L. sp.*) germplasm shows a continuous shift over time from a European to an Asian genetic background*. J. Exp. Bot. 67 (2016), 4711–4725.

## How to apply ?

Please send the following documents by email to :

- Frédéric Proïa : [frederic.proia@univ-angers.fr](mailto:frederic.proia@univ-angers.fr)
- Jérémy Clotault : [jeremy.clotault@univ-angers.fr](mailto:jeremy.clotault@univ-angers.fr)
- UBL research department (copy) : [recherche@u-bretagne Loire.fr](mailto:recherche@u-bretagne Loire.fr)
  - A short Curriculum Vitae and a covering letter showing your interest and especially addressing your professional project.
  - A list of your major works (2 pages max.) : scientific publications, patents and others scientific productions.
  - Letters of recommendation (not required) .
  - A copy of your PhD diploma<sup>2</sup>.

The general selection process is described here :

<https://u-bretagne Loire.fr/dossiers/postdoc/candidatures>

The head(s) of the scientific projects are responsible for the organization of the interviews and the selection of the candidates within their research unit, in compliance with the recruitment rules and

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2 For doctors graduated from a French establishment, a link to the thesis notice in the [SUDOC](#) Catalogue or the French official portal [Theses.fr](http://theses.fr) is sufficient.

practices in force in their supervisory institution(s). A member of the Board of the Université Bretagne Loire Research Department not belonging to the recruiting research unit may represent the Department in recruitment jury.

The candidate will present his-her research works, formation and professional project during 20 minutes, and there will be a question period. Auditions will be organized at the end of October 2017. **[to be confirmed]**

## Further information

Monthly Gross Salary: Around EUR 2,400 (EUR 1,930 Net). **[to be confirmed]**

This Fellowship is cofunded by Université Bretagne Loire and Angers Loire Métropole. **[to be confirmed]**

The Université Bretagne Loire federates 7 universities, 15 “grandes écoles” and 5 research organizations in the West of France (Bretagne and Pays de la Loire). This community of universities and institutions aims to develop the scientific and academic potential of this territory at national and international level.

Angers Loire Métropole is designed for bringing together the attractive features of several municipalities to develop its area, to draw coherent growth strategies, to organize common projects related to economy, environment, solidarity and citizenship, public transports, etc.