Master 2 Internship Bioinformatics 2026

Company or laboratory: University Orléans (FRANCE), Lab P2e (Physiology, Ecology Environment) and INRAE-EPGV Evry (FRANCE)

Address for internship:

Unité EPGV US1279

CEA -Institut de biologie François Jacob

Site d'Evry -Bat G1

2 rue Gaston Crémieux -91057 Evry Cedex

Supervisors (to be contacted for applying with CV, grades obtained in the Master's degree and motivation letter):

Prof Géraldine ROUX, Prof Stéphane MAURY (P2e) and Dr Damien Hinsinger (EPGV)

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Websites: https://www.univ-orleans.fr/en/p2e/teams/biodiversity-ecology-and-evolution-forest-entomofauna; https://www.univ-orleans.fr/en/p2e/teams/trees-and-responses-hydric-and-environmental-constraints); https://epgv.versailles-saclay.hub.inrae.fr/

Internship title: Integrative multi-Omic analysis for pea aphids.

Keywords: Data analysis from Epigenomics and Transcriptomics, NGS data analysis (Long reads and WGBS), integrative statistical analysis and modelling

Internship description:

The **P2E laboratory (Physiology of Trees and Forest Ecosystems, INRAE–Université d'Orléans)** investigates ecological and evolutionary mechanisms involved in insect biological invasions and tree–insect interactions in the context of global change. In parallel, we are developing **epigenetic approaches** to study plant and insect responses to climate stress, integrating **ecophysiology, biochemistry, genetics, and genomics**. The lab collaborates closely with the **EPGV sequencing platform** (Evry) to implement **long-read sequencing technologies** for epigenomic analyses.

We offer a **Master 2 internship** focusing on **integrative bioinformatics and statistical modelling of multi-omics data** generated in the **HOLOSTRESS collaborative project** with the IRBI (CNRS, Tours). Holostress investigates how insect holobionts (hosts and their

microbial symbionts) respond to combined environmental stresses such as heatwaves and pesticide exposure. Using the pea aphid *Acyrthosiphon pisum* as a model, it explores how symbionts influence host thermoregulation, pesticide sensitivity, and thermal tolerance. A central aspect of Task 3 is the analysis of **thermal acclimation** and the role of facultative endosymbionts across life stages and generations, with a pioneering focus on **DNA methylation (methylome profiling)** as a potential epigenetic mechanism of thermal plasticity.

The intern will:

- **Develop and optimize a bioinformatics pipeline** for long-read methylome data (Oxford Nanopore Technology, ONT), using ONT recommendations and state-of-the-art tools for differential methylation analysis.
- Perform **multi-omics integration** (methylome, RNA-seq from IRBI, and phenotypic data) using the R package **mixOmics**.
- Compare newly identified candidate genes with those from an existing methylome pipeline developed at P2E, and carry out additional analyses such as **GO enrichment** and **gene network inference** to provide biological insights in relation to phenotyping data.
- Build reproducible pipelines in **Snakemake/Nextflow, Python, Perl**, etc., for implementation on **HPC platforms**, and produce **publication-ready statistical analyses and visualizations** in R.

The internship will be based at **EPGV (Evry)** or shared between **EPGV and P2E (Orléans)**, depending on candidate preference.

Profile sought: Master 2 student with interests in **genomics, bioinformatics, and multi-omics analyses**, motivated by **pipeline development, programming (Snakemake/Nextflow, Python, or Perl)**, and **exploratory data analysis**. Strong interest in host-microbiome interactions and evolutionary ecology under environmental and climate stress, with the aim of integrating genomic and ecological data to better understand insect-microbiota dynamics.

Allowance: 3800 euros for the 6 months (633 euros per month).