

Research Topic for the ParisTech/CSC PhD Program

Subfield: Evolutionary biology

ParisTech School: AgroParisTech

Title: Evolution of bitter perception in *Drosophila*

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Short description of possible research topics for a PhD:

Most toxic substances are bitter. Why? The commonly accepted hypothesis is that bitterness is a defense mechanism that prevent organisms to ingest noxious compounds. This hypothesis implies that the gustatory repertoire of a species is shaped throughout evolution. However, we have no idea how fast the sensory equipment of an organism can adapt to the occurrence of new toxic molecules distributed in their environment.

Here, we propose to test experimentally this hypothesis on natural and laboratory populations of *Drosophila melanogaster*. We will evaluate the natural phenotypic variability of the bitterness of molecules within natural populations of flies sampled across Europe, using high throughput behavioral approaches and electrophysiology. We will also subject laboratory populations of flies to bitter or toxic molecules and record changes of bitterness perception across generations. We will take advantage of high throughput sequencing techniques to correlate phenotypic and genotypic observations.

Knowing how fast the sensory detection of xenobiotics can evolve in natural populations is crucial if one wants to design strategies to reduce the use of insecticides, by associating them with repellent or deterrent molecules.

Required background of the student: Evolutionary biology and bioinformatics.

A list of representative publications of the group:(1-5)

1. Meunier N, Marion-Poll F, Rospars JP, & Tanimura T (2003) Peripheral coding of bitter taste in *Drosophila*. *J. Neurobiol.* 56(2):139-152.
2. French AS, *et al.* (2015) Dual mechanism for bitter avoidance in *Drosophila*. *J. Neurosci.* 35(9):3990-4004.
3. French AS, *et al.* (2015) *Drosophila* bitter taste(s). *Front. Integrat. Neurosci.* 9.
4. M éry F, Belay AT, So AKC, Sokolowski MB, & Kawecki TJ (2007) Natural polymorphism affecting learning and memory in *Drosophila*. *PNAS* 104(32):13051-13055.
5. Mery F (2013) Natural variation in learning and memory. *Curr. Opin. Neurobiol.* 23(1):52-56.