**Proposition de projet de stage (M1, M2 ou césure) pour l'année universitaire 2025-2026**

**Titre : Division of labor and olfactory processing in the honey bee Apis mellifera**

**Equipe de recherche**
Equipe EVOLBEE : cognition, reproduction et adaptation chez l'abeille
Laboratoire Evolution, Genomes, Comportement et Ecologie (EGCE, CNRS, IRD, Univ. Paris-Saclay, UMR 9191, Gif-sur-Yvette) - IDEEV (Institut Diversité Ecologie et Evolution du vivant)
Website: https://www.egce.universite-paris-saclay.fr/?page_id=3786

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**Description du projet :**

Division of labor and task specialization are key elements explaining the remarkable ecological success of human and animal societies. Social insect colonies are characterized by a highly effective division of labor, with for instance workers generally specializing in brood care early in life and in foraging later in life. The **honey bee** (*Apis mellifera*) is one of the most intensively studied eusocial insect species with a long-standing history as model organism. Colonies of honey bees, composed of up to 60 000 individuals, show a clear division of labor with a specialization of at least 5 different tasks. **But how does the superorganism of the colony coordinate its activities, allowing each individual to know which task to perform and when?** Various theoretical models have been proposed to explain division of labor, most prominently the *response threshold model*, which postulates that individuals differ in their response threshold to task-associated stimuli, and will engage in particular tasks depending on this threshold. While this model has received experimental support for one main task (foraging), there is no comprehensive explanation for how all the different tasks of a social insect colony are triggered. **How is division of labor in a multiple task context implemented?**

The success of social insect colonies lies in the capacity of all its members to behave in a well-organized manner, which involves elaborate communication among colony members. Accordingly, ants, wasps and bees use a wide range of pheromones, intraspecific chemosensory messages, to regulate almost every aspect of their life. Astonishingly, the role of olfaction, the main sensory modality used by insects, on the division of labor has been greatly overlooked.

Using the honey bee *Apis mellifera* as a model, the student will investigate whether **olfaction can give rise to division of labor.** He/She will perform *in vivo* calcium imaging using two-photon microscopy in different worker task groups to study olfactory processing, especially the coding of pheromonal information.

***Background/skills requested:***

- Knowledge in neurosciences and/or neurophysiology
- If possible experience on insects

For more information, feel free to contact me at julie.carcaud[at]universite-paris-saclay.fr
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