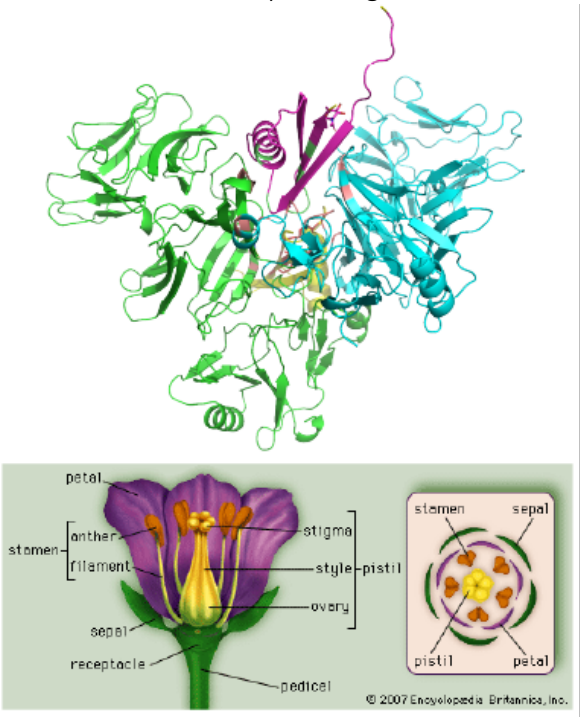
PhD position in **Lille**, on **Receptor-ligand interactions at the self-incompatibility locus in *Arabidopsis***

The PhD project takes place in a cross disciplinary project (https://initiative-excellence.univ-lille.fr/en/our-structural-projects/pursue-research-excellence/cross-disciplinary-projects/pie-cdp), which goal is to understand the evolution of protein interactions. The project investigates how evolutionary changes in protein interactions drive speciation and major innovations in molecular, metabolic, and morphological traits through co-evolutionary processes. This requires large-scale scanning of protein 3D structures and their interactions, both of which remain challenging despite recent advancements in computational structure prediction.

Work package 2.2 of the project focuses on the emergence of novel receptor-ligand interactions at the self-incompatibility locus of *Arabidopsis*. It enholds a PhD project under the co-direction of Dr. Vincent Castric at the Unité Évolution, Écologie et Paléontologie (Evo-Eco-Paleo, https://eep.univ-lille.fr/en/presentation-english/), Dr. Julie Bouckaert at the Unité de Glycobiologie Structurale et Fonctionnelle (UGSF, https://ugsf.univ-lille.fr/en/) and Dr. Fabrice Bray at MS4Omics (https://msap-lab.fr/?lang=en).



Self-incompatibility (SI) is a phenomenon observed in a large fraction of flowering plants that forces them to outcross, because self-fertilization is blocked by various molecular mechanisms. In the family of the *Brassicaceae*, SI relies on the specific interaction of an S-locus receptor kinase (SRK), expressed in pistil papilla cells, and an S-locus cysteine-rich (SCR) protein, located at the pollen surface. Only SCR proteins that are from a different allelic variant than the receiving SRK can lead to fertilization. There are more than 60 different combinations of SCR-SRK possible in this plant family, showing an exceptionally high allelic diversity selected for reproductive success. How the specific pairs of SCR and SRK interact at the molecular level, allowing for self recognition and for the absence of non-self inhibition, remains to be fully explored.

Figure: (top) Crystal structure of the SCR9-SRK9 from Brassica rapa, leading to self-inhibition (bottom; Ma et al. 2016).

The objectives of the PhD project are to explore **SCR and SRK** compatible and incompatible pairs to **study their complexes** using **experimental structural biology** and **biophysical interaction techniques.** The candidate will optimize the recombinant protein production of SCR and SRK in the more suitable expression system (insect and plant cells). The project will be in close connection with another funded PhD project in the Evo-Eco-Paleo lab, aiming at reconstructing and testing ancestral SRK and SCR protein sequences in plants. Monthly meetings are happening between the two labs.

The applicant

We seek an applicant who is skilled in Biochemistry and laboratory practices and who is interested in understanding fundamental aspects of biology and evolution at the molecular to atomic level. Prior knowledge of protein structure and function is essential. Awareness and interest in biophysical methods (such as protein crystallography, cryo-electron microscopy, microcalorimetry) to study protein-protein complexes will give an important head start. The successful candidate is caring and persistent, curiosity-driven, strives for precision and accuracy, and is strongly motivated for experimental work.

How to apply

The position can start any time between **September and December 2025.** Please send a motivation letter and a CV to julie.bouckaert@univ-lille.fr and vincent.castric@univ-lille.fr and include two reference contacts, **before July 14nd 2025.**