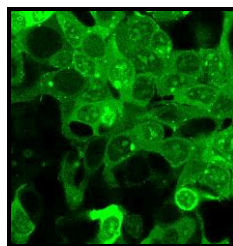


PhD Research Proposal Form China Scholarship Council (CSC) - ENS Group

FIELD: Biology

Thesis subject title: **Deciphering Hox interaction networks in vivo: new tools, new perspectives**



Name of the French doctoral school : BMIC

Name of the Research team : Ontogenesis and Molecular Interactions

Website : <http://igfl.ens-lyon.fr/equipes/s.-merabet-ontogenesis-and-molecular-interactions>

Name of the Supervisor : MERABET

Email : samir.merabet@ens-lyon.fr

Lab Language : French, English

Research Proposal Abstract :

Hox proteins are evolutionary conserved transcription factors controlling cell fate along the antero-posterior axis in animals. They also control numerous other developmental processes during embryogenesis. Hox proteins are supposed to establish intricate interaction networks with surrounding cofactors to control the expression of specific sets of downstream target genes. However, interactions between Hox and cofactors are difficult to reveal because of their dynamics and highly context-specific nature *in vivo*. This PhD proposal aims at capturing and analyzing the dynamics of endogenous Hox-cofactor interactions during *Drosophila* embryonic development.

More specifically, the PhD project will consist in establishing a cutting-edge method called "SplitFAST" in *Drosophila*. Specific nanobodies (small antibodies) will also be developed to make SplitFAST compatible for super resolution live imaging by STED confocal microscopy and LC/MS proteomics. The project will also require skills in bioinformatics for image analyses and modelling of protein-protein interaction networks. Altogether, tools developed during the PhD will provide an unprecedented resolution level of Hox-cofactors and more generally Hox interaction networks in an *in vivo* developmental context.

References :

1- A split fluorescent reporter with rapid and reversible complementation.

Tebo AG, Gautier A. *Nat Commun.* 2019 Jun 27;10(1):2822. doi: 10.1038/s41467-019-10855-0

2- Hox dosage contributes to flight appendage morphology in *Drosophila*.

Paul R, Giraud G, Domsch K, Duffraisse M, Marmigère F, Khan S, Vanderperre S, Lohmann I, Stoks R, Shashidhara LS, **Merabet S**. *Nat Commun*. 2021 May 17;12(1):2892. doi: 10.1038/s41467-021-23293-8.

3- A Live Cell Protein Complementation Assay for ORFeome-Wide Probing of Human HOX Interactomes.

Jia Y, Reboulet J, Gillet B, Hughes S, Forcet C, Tribollet V, Hajj Sleiman N, Kundlacz C, Vanacker JM, Bleicher F, **Merabet S**. *Cells*. 2023 Jan 3;12(1):200. doi: 10.3390/cells12010200.

4- Generation of a versatile BiFC ORFeome library for analyzing protein-protein interactions in live *Drosophila*.

Bischof J, Duffraisse M, Furger E, Ajuria L, Giraud G, Vanderperre S, Paul R, Björklund M, Ahr D, Ahmed AW, Spinelli L, Brun C, Basler K, **Merabet S**. *Elife*. 2018 Sep 24;7:e38853. doi: 10.7554/eLife.38853.

Type of PhD :

1.Full PhD

- Joint PhD/cotutelle (leading to a double diploma) : NO
- Regular PhD (leading to a single French diploma) : YES

2. Visiting PhD (for students enrolled at a Chinese institution who will be invited to a French institution to carry out a mobility period) : NO