

GRAL MASTER 2 RESEARCH SCHOLARSHIP - Program 2016 - 2017

CALL FOR RESEARCH INTERNSHIP TOPICS

Deadline for proposal submission: DECEMBER 11th, 2015

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MASTER II University programs compatible with the scholarship program:

Master in biology: Specialty biochemistry and structural Biology / Specialty cell Biology, Physiology and development / Specialty neurobiology and neurosciences / Specialty immunology, microbiology, infectiology/ Master Biology, Ecology, Environment

Master in physics: Specialty « Exploring life and environment » (EVE)

Master in Nanosciences, nanotechnologies: Specialty Nanochemistry-Nano-objects / Specialty Nanobiology-Nanobiotechnology / Specialty Nanophysics – Nanostructures

INTERNSHIP PROPOSAL

Institute and Group: iRTSV, Laboratoire de Physiologie Cellulaire et Végétale

Supervisor: Christel Carles

Phone: +33 (0)4 38 78 41 95

Email: Christel.carles@ujf-grenoble.fr

Research project title: Characterization of physical interaction between antagonistic chromatin regulators

5 Keywords to describe the project: Chromatin Biology, Polycomb, Histone methyl transferase, stem cell fate

Description of the project (aims, experimental techniques, recommended background):

10 to 15 lines:

The SAND domain-containing protein ULTRAPETALA1 (ULT1) regulates stem cell fate in plants¹. We previously showed, using genetics and genome-wide approaches, that ULT1 activates the expression of a large panel of developmental genes in a manner antagonistic to CURLY LEAF (CLF), a member of the Polycomb complex (PcG)²⁻⁴. CLF is homologous to the human Ezh2 chromatin factor that methylates Histone 3 on lysine K27 (H3K27me3 repressive mark)⁵. The internship project will contribute to our quest for the molecular mechanism through which ULT1 counteracts CLF function. To this aim, the student will work on recombinant proteins in order to (i) characterize ULT1-CLF physical interactions, (ii) assess ULT1 effect on the assembly of CLF and PcG partners and (iii) assay CLF histone methyl transferase activity in absence or presence of ULT1.

A background in molecular biology and biochemistry is recommended. Interest in protein purification and interaction assays will be appreciated.

Justification that the internship's subject fits with the general theme of GRAL (3 lines):

This project is based on a developmental genetic and epigenetic state-of-the-art^{1,2}, as well as recent structure-function discoveries⁵. It combines a biochemistry approach to functional genetic and epigenomic analyses performed in the lab. This integrated structural and cell biology study thus particularly fits within the framework of the labex Gral.

¹ C.C. Carles, D. Choffnes-Inada, K. Reville, K. Lertpiriyapong, J.C. Fletcher (2005). *ULTRAPETALA1* encodes a SAND domain putative transcriptional regulator that controls shoot and floral meristem activity in Arabidopsis. *Development* 132: 897-911.

² C.C. Carles and J.C. Fletcher (2009). The SAND domain protein ULTRAPETALA1 acts as a trithorax group factor to regulate cell fate in plants. *Genes & Development*. 23: 2723-2728.

³ J. Engelhorn, R. Blanvillain and C.C. Carles (2014). Molecular control of cell fate in plants: Mechanisms of gene activation from a chromatin point of view. *Cell. Mol. Life Sc.* 71:3119-37.

⁴ Y. Chanvivatana, A. Bishopp, D. Schubert, C. Stock, Y.-H. Moon, Z.R. Sung, J. Goodrich (2004). Interaction of Polycomb-group proteins controlling flowering in Arabidopsis. *Development* 131, 5263-5276.

⁵ L. Jiao and X. Liu (2015). Structural basis of histone H3K27 trimethylation by an active polycomb repressive complex 2. *Science* 350, aac4383-1-8.

Relevant publications of the team (3 max):

J. Engelhorn, R. Blanvillain and **C.C. Carles*** (2014). Molecular control of cell fate in plants: Mechanisms of gene activation from a chromatin point of view. *Cell. Mol. Life Sc.* 71:3119-37. IF= 5,86

C. Smaczniak, R.G.H. Immink, J.M. Muino, R. Blanvillain, M. Busscher, J. Busscher-Lange, Q.D.P. Dinh, S. Liu, A.H. Westphal, S. Boeren, F. Parcy, L. Xu, **C.C. Carles**, G.C. Angenent, K. Kaufmann* (2012). Characterization of MADS-domain transcription factor complexes in *Arabidopsis* flower development. *Proc Natl Acad Sci USA*. 109:1560-5. IF= 9,81

C.C. Carles and J.C. Fletcher (2009). The SAND domain protein ULTRAPETALA1 acts as a trithorax group factor to regulate cell fate in plants. *Genes & Development*. 23: 2723-2728. IF= 12,08