ParisTech ESPCI PARIS | PSL

RESEARCH TOPIC FOR THE PARISTECH/CSC PHD PROGRAM

Field: Life and Health Science and Technology
Subfields: Neurosciences, Neuropathology

Title: **PROPAGATION OF NEURODEGENERATION IN PARKINSON'S DISEASE STUDIED IN *DROSOPHILA* MODELS**

ParisTech School: ESPCI Paris | PSL

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(Lab/Advisor website): (https://www.bio.espci.fr/-Serge-Birman-Genes-Circuits-29-)

Short description of possible research topics for a PhD:

In our group, we are studying the role of specific neurotransmitter systems on brain functioning and behaviour, as well as their susceptibility to ageing and neurodegenerative conditions. This involves integrated studies that combine molecular biology, genetics and behavioural analysis to identify genes, neural circuits and mechanisms controlling locomotor activity and pathogenesis. Our model is the fruit fly *Drosophila*, which is used in laboratories around the world as it offers many tools and advantages for genetic and *in vivo* studies. The topic of the PhD will be to carry out research on Parkinson's disease models, with the aim to understand the mechanisms leading to the propagation of neurodegeneration from one neuron to another by a prion-like mechanism, as this may explain the clinical progression of the disease. This study will be based on solid preliminary results recently obtained in the laboratory by a previous doctoral student of the ParisTech/CSC PhD Program.

Required background of the student: Master's degree in Life Sciences (or Agriculture), ideally with previous training in Molecular Biology.

A list of 5 (max.) representative publications of the group:

1. YON, M., DECOVILLE, M., SAROU-KANIAN, V., FAYON, F., BIRMAN, S. (2020) Localized metabolic profiling of living *Drosophila* in neurodegenerative conditions using ^{1}H magic angle spinning NMR. **Sci. Rep.** 10(1), 9516–9. http://doi.org/10.1038/s41598-020-66218-z
2. HAJJI, K., MTEYREK, A., SUN, J., CASSAR, M., MEZGHANI, S., LEPRINCE, J., VAUDRY, D., MASMOUDI-KOUKI, O.*, BIRMAN, S.* (2019) Neuroprotective effects of PACAP against paraquat-induced oxidative stress in the *Drosophila* central nervous system. **Hum. Mol. Genet.** 28(11):1905-1918 doi:10.1093/hmg/ddz031
3. ISSA A.-R., SUN J., PETITGAS C., MESQUITA A., DULAC A., ROBIN M., MOLLEREAU B., JENNY A., CHÉRIF-ZAHAR B., BIRMAN S. (2018) The lysosomal membrane protein LAMP2A promotes autophagic flux and prevents SNCA-induced Parkinson disease-like symptoms in the *Drosophila* brain. **Autophagy** 14(11):1898–1910, doi:10.1080/15548627.2018.1491489
4. VACCARO A., ISSA A.-R., SEUGNET L., BIRMAN S., & KLARSFELD A. (2017) *Drosophila* Clock is required in brain pacemaker neurons to prevent premature locomotor aging independently of its circadian function. **PLOS Genet.** 13(1):e1006507, doi:10.1371/journal.pgen.1006507
5. RIEMENSPERGER T., ISSA A.-R., PECH U., COULOM H., NGUYỄN M. V., CASSAR M., JACQUET M., FIALA A. & BIRMAN S. (2013) A single dopamine pathway underlies progressive locomotor deficits in a *Drosophila* model of Parkinson disease. **Cell Rep.** 5:952–960 doi:10.1016/j.celrep.2013.10.032