Systems neuroscience of Drosophila:
From genes to circuits to behaviours

FLiACT meeting Leuven / Beerse – Turnhout
2014, November 4 – 6

Workshops

"Systems Molecular Biology for Neural Circuit Analysis"

"From Science to Industry"

Systems Molecular Biology for Neural Circuit Analysis

Organizer: Bassem Hassan, VIB

4th November, Tuesday

09:00   Lecture by **Hugo Bellen** (Baylor College of Medicine, Houston, Texas)

"**Engineering Flies - Genomics Tools for Neuroscience**"

Drosophila is currently the eukaryotic model organism that permits the most sophisticated in vivo manipulations to address the function of neurons and neuronally expressed genes. I will summarize some of the techniques that help assess the role of specific neurons by labeling, removing, or altering their activity. I will also survey genetic manipulations to identify and characterize neural genes by mutation, overexpression, protein labeling, and reversible protein removal.

Background readings:

(1) Venken, K.J.T. et al, 2011. MiMIC: a highly versatile transposon insertion resource for engineering Drosophila melanogaster genes. Nature Methods 8:737-743. PMID: 21985007

(2) Venken, K.J.T. et al, 2011. Genetic manipulation of genes and cells in the nervous system of the fruit fly. Neuron 72:202-230. PMID: 22017985

10:00   Break

10:30   Wrap up discussion with **Hugo Bellen**

12:00   Lunch

13:00   Lecture by **Pavel Tomancak** (MPI of Molecular Cell Biology and Genetics, Dresden)

"**Imaging of Gene Expression during Neural Development**"

Modern live imaging microscopy approaches enable capture of dynamic biological processes *in vivo* over extended periods of time and at high resolution. Such recordings typically result in large amounts of image data. Analysis of such data poses computer science challenges on a scale never before encountered by biologists. I will discuss these challenges in the context of acquisition and analysis of multi-view light sheet microscopy time lapse recordings of Drosophila embryonic development.

Background readings:

(1) Jug, F. et al, 2014. Bioimage Informatics in the context of Drosophila research. Methods, 68, no. 1, pp. 60-73, PMID: 24732429

(2) Schmied, C. et al, 2014. Open-source solutions for SPIMage processing. Methods Cell Biol., 123, pp. 505-529, PMID: 24974045

(3) Preibisch, S. et al, 2014. Efficient Bayesian-based multiview deconvolution. Nat. Methods, 11, no. 6, pp. 645-648, PMID: 24747812

14:00   Break

14:30   Wrap up discussion with **Pavel Tomancak**

16:00   Free afternoon

5th November, Wednesday

09:00 Lecture by **Stein Aerts** (KU Leuven, Center for Human Genetics)

"Systems Biology of Gene Regulation in Drosophila"

We will discuss systems biology applications to decipher gene regulatory networks underlying retinal determination in Drosophila. Particularly, I will give an outline of next-generation sequencing approaches to measure gene expression and chromatin activity, and of computational approaches to identify cis-regulatory elements and to infer gene regulatory networks. I will also explore comparative genomics and the evolution of cis-regulation across the Drosophila phylogeny.

Background readings:

(1) Naval Sanchez M. et al., 2013. Comparative motif discovery combined with comparative transcriptomics yield accurate targetome and enhancer predictions. Genome Research, 23(1):74-88, PMID: 23070853

(2) Herrmann C. et al., 2012. i-cisTarget: an integrative genomics method for the prediction of regulatory features and cis-regulatory modules. Nucleic Acid Research, PMID: 22718975

(3) Janky R, et al., 2014. iRegulon: From a Gene List to a Gene Regulatory Network Using Large Motif and Track Collections. PLoS Comput Biol. 2014 Jul 24;10(7):e1003731, PMID: 25058159

10:00 Break

10:30 Wrap up discussion with **Stein Aerts**

12:00 Lunch

14:00 **Wrap up discussion about the FLiACT opinion paper (only FLiACT students)**

16:00 Break

16:30 **Planning for FLiACT Lisboa summer school 2015 (only FLiACT students)**

6th November, Thursday

08:30   Departure from Novotel Hotel in Leuven by bus to Beerse.

Janssen Pharmaceutica, Beerse
Eric Snoeckx (Director Open Innovation and Networking)

09:45   Coffee and welcome at Janssen Pharmaceutica, Beerse

10:00   Presentation on "Trends in Life Sciences"

Personalised medicine will change the way the life science industry operates. The focus is shifting from treatment to prevention and new players appear from different business fields.

10:45   Break

11:00   Presentation "Janssen Labs"
Janssen labs is a new initiative of Janssen Pharmaceutica attracting start ups and emerging research companies with a 'no strings attached' philosophy.

12:00   Sandwich Lunch
13:00   Departure by bus from Janssen Pharmaceutica to Open Manufacturing Campus

The Open Manufacturing Campus (OMC), Turnhout
Marc Corthout (Director OMC)

13:15   Presentation "The Open Manufacturing Campus"

Vision, status and planning of the Open Manufacturing Campus initiative, part of Flanders' drive towards Factories of the Future. OMC's ambition is to become the most productive square km in hightech and life sciences.

14:00   Factory Tour - Philips Lighting

Industrial real life, on the floor examples of technology development, product development and automation in production. Visits to the laser labs, micromanipulation work stations, computer vision based quality control, and a tour of production facilities.

15:00   **Keynote lecture: Harry Christiaens (CEO PharmaVize)**

"From Science to Industry, succesful **entrepreneurship in the drug development value chain."**

16:00   **Presentations by the founders of Peira and DCI Labs: Hans Nicasy, Barbara Weyn**

Peira and DCI labs are two start ups with its roots in the Life Science Research Community in Flanders. Peira specialises in developing customised research tools and platforms. DCILabs develops and sells digital cell imaging software and analysis software for novel assays.

17:00   Walking dinner with the director of OMC

18:30   Departure from OMC Turnhout to Novotel Hotel in Leuven