



Systems neuroscience of *Drosophila*:
From genes to circuits to behaviours

FLiACT workshop @ CRG Barcelona

C/ Dr. Aiguader, 88, 08003 Barcelona, www.crg.es



Good Scientific Practice workshop
Good science, honest science

6th of July 2014

Scientific workshop

**Introductory workshop on neural and behavioral
modeling in *Drosophila***

7th - 9th of July 2014



Agenda

Date	time	PRBB – room	Topic	Speaker / Instructor
Sunday, 6th	2:30 pm – 6 pm	Charles Darwin	<u>Good science, honest science</u> Research Integrity workshop	Michele Garfinkel Alison North
	6 pm – 7:30 pm	Outdoor square	Beer & Pizza session	
	7:30 pm - 9 pm	Charles Darwin	eLife publication – status meeting	FLiACT students
Monday, 7th	9 am – 6:30 pm	Marie Curie	<u>Neural and behavioral modeling in Drosophila I</u> Spiking neurons, Neuronal networks, Models of the olfactory system	Thomas Nowotny
	6:30 pm – 8 pm	Charles Darwin	eLife publication – working meeting	FLiACT students, Matthieu Louis
	8:30 pm, invited dinner at “Taller de Tapas”			
Tuesday, 8th	9 am – 6:30 pm	Marie Curie	<u>Neural and behavioral modeling in Drosophila II</u> Bayesian models of perception and action	Ruben Moreno Bote
	Beach Volley			
	8:30 pm, dinner at Moncho’s Chiringuitos las Sardinitas			
Wednesday, 9th	9 am – 6:30 pm	Marie Curie	<u>Neural and behavioral modeling in Drosophila III</u> Searching for simplicity in brains, behavior and natural experience	Greg Stephens
	6:30 pm, Barrio – Bar – Hopping			

Good Scientific Practice workshop

Good science, honest science

6th July 2014

Scientific journals, funding agencies and research institutions are becoming increasingly concerned about the quality of the research - in terms of good scientific practice - that they publish, fund or host.

This workshop will refresh your knowledge about the tangled topic of keeping science sound and honest. You will discuss the latest thinking in responsible research conduct and learn how to analyse and manipulate images with integrity.

time	PRBB – room	Topic	Speaker
2:30 pm – 4 pm	Charles Darwin	Responsible Conduct of Research: From Policy to Practice	Michele Garfinkel
4 pm – 4:30 pm	Outdoor square	Coffee Break	
4:30 pm - 6 pm	Charles Darwin	Acquiring and presenting reliable scientific imaging data – the Good, the Bad, the Ugly and the Downright Dishonest	Alison North

Responsible Conduct of Research: From Policy to Practice, Michele Garfinkel.

The responsible conduct of research encompasses a large variety of concepts, from how to choose a research project to how data are reported. Some principles of research integrity are universal. Some are highly specific to a particular research field. Many parameters of the responsible conduct of research contain culture-specific aspects that may make guidance difficult to generalize to all researchers.

In Europe, guidance and rules concerning research integrity are changing rapidly, and in some places being introduced for the first time. In this talk, I will provide a brief overview of the rationales and structures for guidance on responsible conduct of research. We will then together work through scenarios from several fields of research, including a structured analysis of stakeholders views with respect to research integrity. Finally, I will discuss current work in the research integrity community to illustrate how views of responsible conduct may change over time, and how decision-makers respond to such new information.

MICHELE S. GARFINKEL is the Manager of the Science Policy Programme at the European Molecular Biology Organization in Heidelberg, Germany. Her work focuses on societal concerns for the introduction of new biological technologies, scientific publishing, and the responsible conduct of research, approached primarily through technology assessment studies.

Acquiring and presenting reliable scientific imaging data - the Good, the Bad, the Ugly and the Downright Dishonest, Alison North.

Image manipulation is an all-too-frequent problem encountered by the editors of scientific journals. Manipulations to submitted images range from minor, inappropriate changes to blatantly fraudulent practices but all such changes can be classed as scientific misconduct. To complicate matters further, unreliable imaging data is frequently acquired in innocence simply due to insufficient understanding of the experimental manipulations and microscope set-up used. This workshop aims to clarify the difference between acceptable and unacceptable changes to scientific images and to present some of the common presentation guidelines established by top scientific journals. We will then examine some of the causes of unreliable imaging data, including poor specimen preparation or probe choice, incorrect microscope set-up and acquisition parameters, spherical and chromatic aberrations, light-induced artifacts and over-expression artifacts. We will examine the usefulness of the term “co-localization” in the modern era of super-resolution microscopy. Finally we will discuss good practices for appropriate image storage, image processing and image presentation regimes.”

ALISON NORTH is the Senior Director of the Bio-Imaging Resource Center and a Research Associate Professor at the Rockefeller University (RU) in New York. Trained mainly in electron microscopy until she became hooked on live cell imaging, she now advises and trains hundreds of RU and external researchers in a wide variety of optical microscopy techniques. She was consulted by the editors of the Journal of Cell Biology (RU Press) when they established their guidelines for authors on image manipulation, and subsequently authored a JCB feature article entitled “Seeing is believing? A beginners’ guide to practical pitfalls in image acquisition”.

7th July 2014: Spiking neurons, Neuronal networks, Models of the olfactory system

Instructor: Thomas Nowotny, Professor of Informatics, University of Sussex, CCNR)

Assistant: Kostas Lagogiannis

Background Reading: **(1)** Hodgkin, A. L. & Huxley, A. F. A quantitative description of membrane current and its application to conduction and excitation in nerve. 1952. *Bull. Math. Biol.* **52**, 25–71; discussion 5–23 (1990). **(2)** Nowotny, T., Huerta, R., Abarbanel, H. D. I. & Rabinovich, M. I. Self-organization in the olfactory system: one shot odor recognition in insects. *Biol Cybern* **93**, 436–446 (2005). **(3, optional)** Papadopoulou, M., Cassenaer, S., Nowotny, T. & Laurent, G. Normalization for sparse encoding of odors by a wide-field interneuron. *Science* **332**, 721–725 (2011).

time	PRBB – room	Topic
9 – 11 am	Marie Curie	<p><i>Lecture</i></p> <p>1. You will be able to describe and be ready to use simple Hodgkin-Huxley type conductance based models.</p> <p>2. You will appreciate that HH neuron models can be reduced to simpler neuron models, including IF, Rulkov map neurons.</p>
11 – 11:30 am	Outdoor square	Coffee Break
11:30 am – 1:30 pm	Marie Curie	<p><i>Practical</i></p> <p>You will complete and use MATLAB functions to simulate HH type neurons (original HH model, Traub&Miles hippocampal neuron model). You will simulate Rulkov maps and match them to the Traub and Miles model by parameter adjustment.</p> <p>We will explore the role of a number of key parameters and you will learn how to visualize your results in effective ways.</p> <p>Lunch in PRBB cantine</p>
2:30 – 4:30 pm	Marie Curie	<p><i>Lecture</i></p> <p>1. You will be able to explain the main elements of the insect olfaction model of Nowotny et al. 2005, including an appreciation of the ideas of sparse coding, self-organization, “Hebbian” learning, and parallels to machine learning/ kernel tricks.</p> <p>2. You will be able to explain the problems of sparse coding in divergent neural networks and the concept and necessity of gain control.</p>
4:30 – 5 pm	Outdoor square	Coffee Break
5 – 6:30 pm	Marie Curie	<p><i>Practical</i></p> <p>You will complete MATLAB scripts to simulate neural networks. You will investigate divergent connectivity and the effects of gain control, both feed-forward and feedback.</p>

8th July 2014: Bayesian models of perception and action

Instructor: Ruben Moreno Bote, Labhead of Computational Neuroscience, Universitat Barcelona

Assistant: Philipp Schustek

Background Reading: (1) Ernst, M. O. & Banks, M. S. Humans integrate visual and haptic information in a statistically optimal fashion. *Nature* **415**, 429–433 (2002). (2) Gold, J. I. & Shadlen, M. N. The neural basis of decision making. *Annu. Rev. Neurosci.* **30**, 535–574 (2007).

time	PRBB – room	Topic
9 – 11 am	Marie Curie	<p><i>Lecture:</i> Bayesian models of perception.</p> <p>1. We will discuss how in humans and primates, performance in decision making tasks can often be described by optimal models of behavior. We will discuss as an example the paper of Ernst and Banks. A comparison to signal detection theory will be made.</p> <p>2. We will relate simple population activity codes to behavioral performance. From Poisson population codes to behavior. Psychometric curves.</p> <p>We will discuss the applications of these results to Drosophila.</p>
11 – 11:30 am	Outdoor square	Coffee Break
11:30 am – 1:30 pm	Marie Curie	<p><i>Practical:</i> Measure your performance and reaction time in a detection task. Program a detection task where a target appears in one of two locations. The task is to detect location as accurately and fast as possible. Keyboard input will be collected. The data will be analyzed.</p> <p>Finger-food lunch on CRG terrace, 5th floor</p>
2:30 – 4:30 pm	Marie Curie	<p><i>Lecture:</i> Bayesian models of action.</p> <p>We will describe Bayesian models for decision-making tasks that require accumulation of evidence over time. We will describe diffusion and race models. We will give as an example the case of monkey decision-making in a perceptual task that requires integration over time, based on the description of Gold and Shadlen.</p> <p>We will discuss open problems of accumulation of information in the insect world, in particular optimal integration of information in Drosophila.</p>
4:30 – 5 pm	Outdoor square	Coffee Break
5 – 6:30 pm	Marie Curie	<p><i>Practical:</i> Generate reaction times with a diffusion model</p> <p>Programming exercise where a diffusion model is generated using Monte-Carlo methods. Theoretical predictions from the model will be compared to the performance and reaction times measured in the first practical.</p>

9th July 2014: Searching for simplicity in brains, behavior and natural experience

Instructor: Greg Stephens, Associate Professor at Theoretical Physics of Complex Systems, Vrije Universiteit Amsterdam

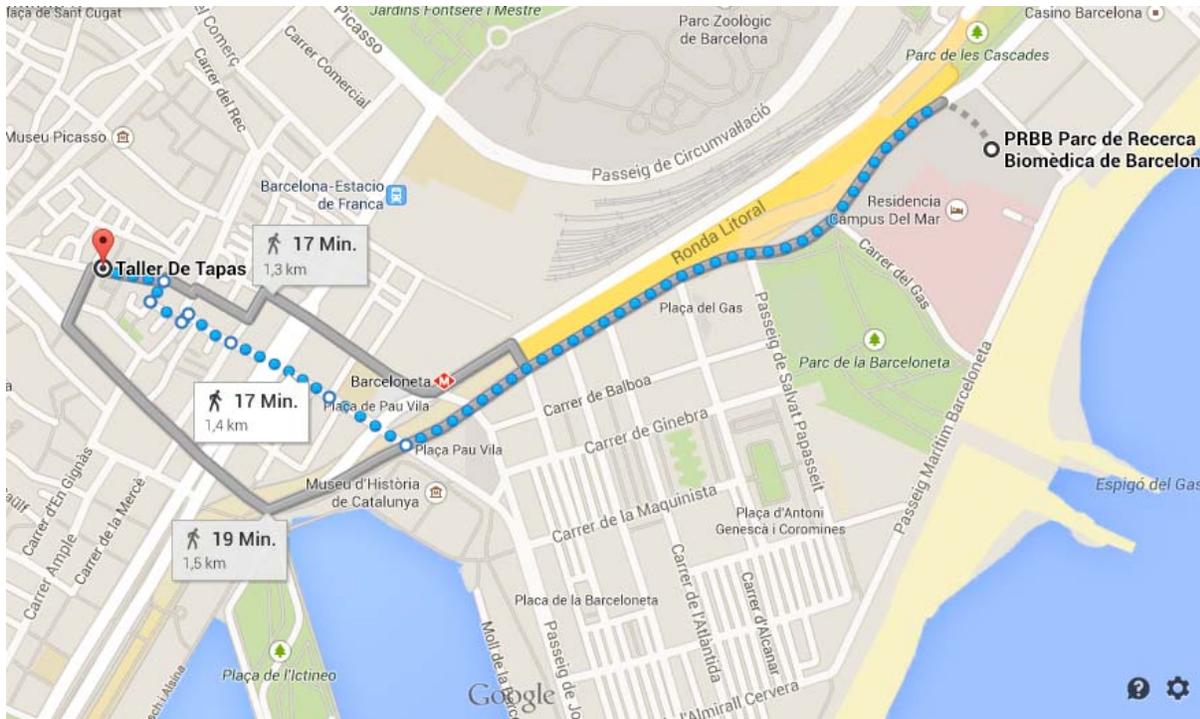
Assistant: Balazs Szigeti and Onno Broekmans

Background Reading: **(1)** Stephens, G. J., Johnson-Kerner, B., Bialek, W. & Ryu, W. S. Dimensionality and dynamics in the behavior of *C. elegans*. *PLoS Comput. Biol.* **4**, e1000028 (2008). **(2)** Stephens, G. J., Silbert, L. J. & Hasson, U. Speaker-listener neural coupling underlies successful communication. *Proc. Natl. Acad. Sci. U.S.A.* **107**, 14425–14430 (2010).

time	PRBB – room	Topic
9 – 11 am	Marie Curie	<i>Lecture:</i> Demonstration of the power of simple analysis methods using examples from a variety of natural systems.
11 – 11:30 am	Outdoor square	Coffee Break
11:30 am – 1:30 pm	Marie Curie	<i>Practical:</i> Introduction to the quantitative analysis of natural behavior through principal components analysis (pca) in the space of natural worm wiggles. Gaussian probability distributions and covariance analysis. Lunch in PRBB canteen
2:30 – 4:30 pm	Marie Curie	tbd
4:30 – 5 pm	Outdoor square	Coffee Break
5 – 6:30 pm	Marie Curie	tbd

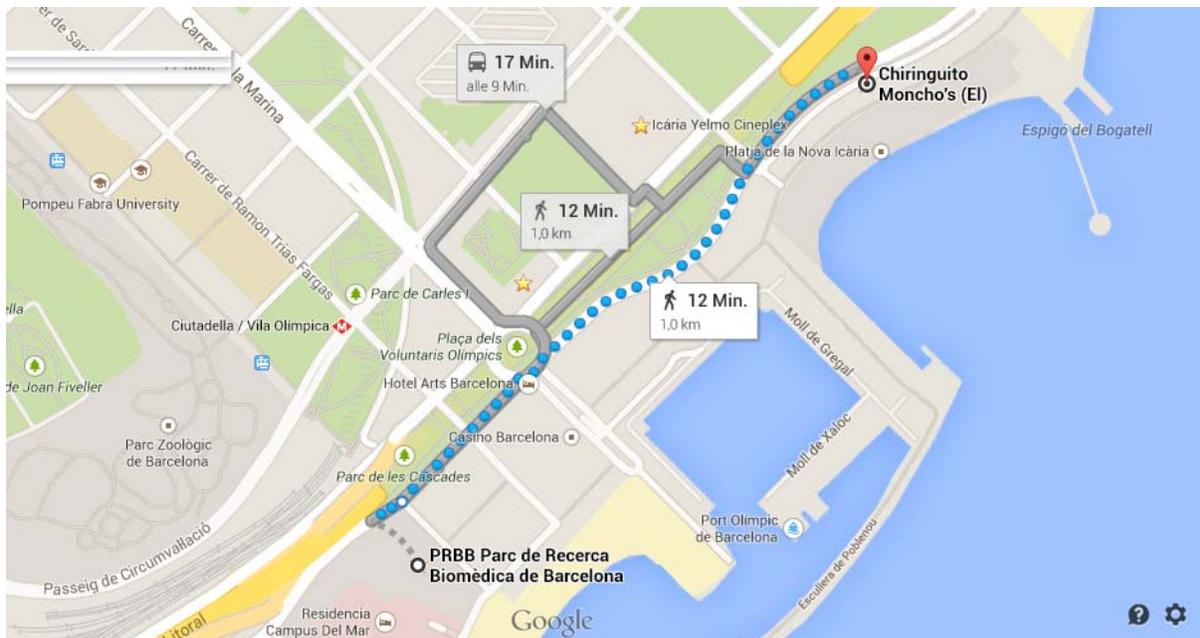
Restaurant “Taller de Tapas”

Carrer Comtal 28, tallerdetapas.com



Moncho's Chiringuitos “Las Sardinitas”; Avinguda del Litoral 36

<http://www.monchos.com/es/chiringuito-las-sardinitas/>



Attendees List

1. Ahmed Mohamed FLiACT
2. Sercan Sayin FLiACT
3. Samuel J. Walker FLiACT
4. Simon Weinberger FLiACT
5. Ivan Larderet FLiACT
6. Marianthii Karageorgi FLiACT
7. Rajyashree Sen FLiACT associate, Janelia Farm
8. Sayanne Soselisa FLiACT
9. Guangda Liu FLiACT
10. Tanmay Nath FLiACT
11. Elena Knoche External, CRG
12. Ibrahim Tastekin FLiACT
13. Ajinka Deogade FLiACT
14. Elie Fink FLiACT
15. Valentina Ferlito FLiACT
16. Balazs Szigeti External, Seminar assistant for Greg Stephens, University of Edinburgh (MINIMAL project)
17. Manuela Marescotti External, Brainwave Discovery Edinburgh
18. Veronica Corrales External, Chamalimaud Lisbon
19. Onno Broekmans External, Seminar assistant for Greg Stephens, University Amsterdam
20. Kostas Lagogiannis External, Seminar assistant for Thomas Nowotny, University of Edinburgh (MINIMAL project)
21. Philipp Schustek External, Seminar assistant for Ruben Moreno, Fundació Sant Joan de Déu, Barcelona
22. Amelie Baschwitz External, PMI Jena
23. Antoine Wystrach External, University of Edinburgh (MINIMAL project)