



1. Learning Objectives

After completion of this course, by using various experimental models from invertebrates to higher vertebrates, the students will be able to :

- Master the cellular and synaptic mechanisms that allow a neuronal network to produce a physiologically relevant activity
- Understand the mechanisms underlying the functional flexibility (plasticity) of neuronal networks
- Understand cutting edge techniques for studying neuronal circuits (optogenetic, chemogenetic, functional imaging, ...)
- Develop and apply relevant electrophysiological and pharmacological experiments and computer-based simulations to decipher the cellular and synaptic mechanisms underlying the functioning of a neuronal network
- Make a critical analysis of an experimental work

2. Speakers/topics include

D. Combes: general principles of neuronal circuits operation and their modulation

A. Beyeler: Modern techniques for circuits analysis ; example of circuits from amygdala and insular cortex and their role in anxiety

R. Nargeot: Learning in feeding networks / hybrid networks

A. Leblois: Exploration, motor variability and the basal ganglia-thalamo-cortical network: Lessons from songbirds

M. Wolff + A. Groh (Heidelberg Germany) : Thalamocortical networks: sensorimotor, integrative and cognitive functions

P. Branchereau: Spontaneous activities (cortex, spinal cord ...) and their role in SNC development

C. Dubois: Brainstem respiratory networks: circuits operation, interaction and development

L. Juvin: Neuronal circuits interaction: example of the locomotion-Respiration interaction

Invited speaker: Keith SILLAR (Univ. St Andrews Scotland). Neuroethology of predation and escape.

3. Teaching

Lectures and seminars

Neuronal networks simulation tutorials (Neurosim) to analyse the functioning of neuronal circuits. Students (by groups) will learn to design appropriate protocols in electrophysiology and pharmacology, write a scientific report and provide an oral presentation of their own experimental results and be a referee for other students' paper.

4. Examination

Continuous assessment (Neurosim tutorials) 30%

Final written exam 70%

