

## Scientific and technical environment of the training course



### Institut de la vision

<http://www.institut-vision.org/fr>

### Institut Carnot Voir et Entendre

<http://www.fondave.org/>

## COURSE DIRECTORS

### Valentina EMILIANI

Senior researcher

UMR 7210

### Eirini PAPAGIAKOUMOU

Researcher

UMR 7210

## LOCATION

PARIS (75)

## ORGANISATION

8 days

From 09:00 am to 06:00 pm

Training course in English

From 7 to 20 attendees

The next session will take place in March 2024. Registration will open in July 2023.

## TEACHING METHODS

Lectures (23 h), workshops (28 h) and presentations of projects (8 h)

Files in PDF format will be made available to the trainee.

## TRAINING FEES

3000 Euros

## AT THE END OF THE TRAINING COURSE

- Satisfaction survey from trainees
- A training certificate is delivered

## COURSE DATE

**Ref. 24 004** : from Monday 18/03/24 to Wednesday 27/03/24

# Optical control of brain functioning with optogenetics and wave front shaping

## OBJECTIVES

- Learn how to choose the most suitable combination of actuator, illumination methods and targeting strategy for each specific application
- Acquire the skills and technologies required to design and build up an optical system for optical control of neuronal circuits

## AUDIENCE

Neurophysiologists, physicists (researchers, PhD students or engineers)

## PRE-REQUIREMENT

Attendees should have a strong background in neurosciences or in cell biology or in optical microscopy. To adapt the programme to trainees' expectations, we invite the attendees to download and fill out the survey from our web site and submit it when performing the pre-registration.

## TRAINING PROGRAMME

### Lectures

- Introduction to optogenetics
- Wave front shaping and liquid crystal matrix
- Viral vector design
- Computer generated holography
- Generalized phase contrast
- Temporal focusing
- Three-dimensional light patterning and temporal focusing
- Two-photon optogenetics: scanning, spiral scanning, parallel illumination: examples and comparison among the different approaches
- All-optical interrogation of brain circuits
- Voltage and calcium imaging
- Two-photon all-optical circuits manipulation in freely moving mice
- Patterned voltage and calcium imaging
- Three photon imaging and optogenetics

### Practical courses (in small rotating groups of 7 attendees max with 2 trainers per group)

- How to build up a holographic optical set-up (optical design and software)
- *In vitro* and *in vivo* all-optical manipulation of neuronal circuits
- Two-photon all-optical circuits manipulation in freely moving mice
- Two-photon scanless voltage imaging
- Projects from applicants (practical): proposition of projects by the attendees and discussion on their feasibility

## SPEAKERS

V. Emiliani, E. Papagiakoumou, N. Accanto, E. Ronzitti, D. Dalkara, D. Tanese, C. Grimm, R. Sims (researchers, IDV, Paris), C. Wyart (researcher, ICM, Paris), D. Oron (professor, Weizmann Institute), M. Lin (researcher, Stanford University), J. Vierock (researcher, Charité - Universitätsmedizin Berlin) and C. Xu (professor, Cornell University).