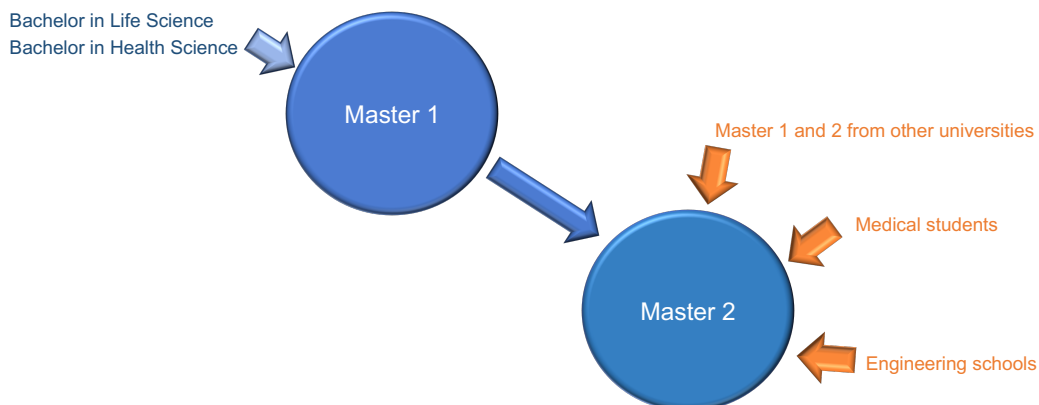


MASTERS STUDIES IN NEUROSCIENCE AT SORBONNE UNIVERSITÉ

The Master BIP-Neuroscience program trains students in all fields of neuroscience:

- *cellular and molecular neuroscience*
- *integrated neuroscience*
- *cognitive neuroscience*
- *systems and computational neuroscience*
- *behavior*
- *development*
- *vision*
- *neurodegenerative diseases*
- *psychiatric diseases*
- ...

The program extends over **2 years**, with the possibility of joining **directly in the 2nd year** (depending on previous training).



Our training program is based on:

- more than **38 teaching modules in neuroscience** supported by recognized specialists (researchers, teachers/researchers, clinicians, ...)
- more than **200 research teams**, in France and abroad, regularly involved in our training.
- close collaboration, for teaching and research training, with the **4 Sorbonne Université neuroscience institutes** (Neuroscience Paris Seine, Paris Brain Institute, Institut de la Vision, Institut du Fer à Moulin), and with the Institut Pasteur and the Ecole Normale Supérieure (ENS)
- **3 international training programs** in partnership with **University College London**, **University of Heidelberg**, **National Autonomous University of Mexico**, **Indian Institute of Technology Delhi**, and **Trinity College Dublin**
- **10 months of internship** in internationally-recognized laboratories in France or abroad

The Neurosciences are fundamentally interdisciplinary, and our program is aimed at students from many different backgrounds -- **life sciences, medical training, engineering, mathematicians, computer sciences** -- aiming to pursue a career in neuroscience in the public or private sector.

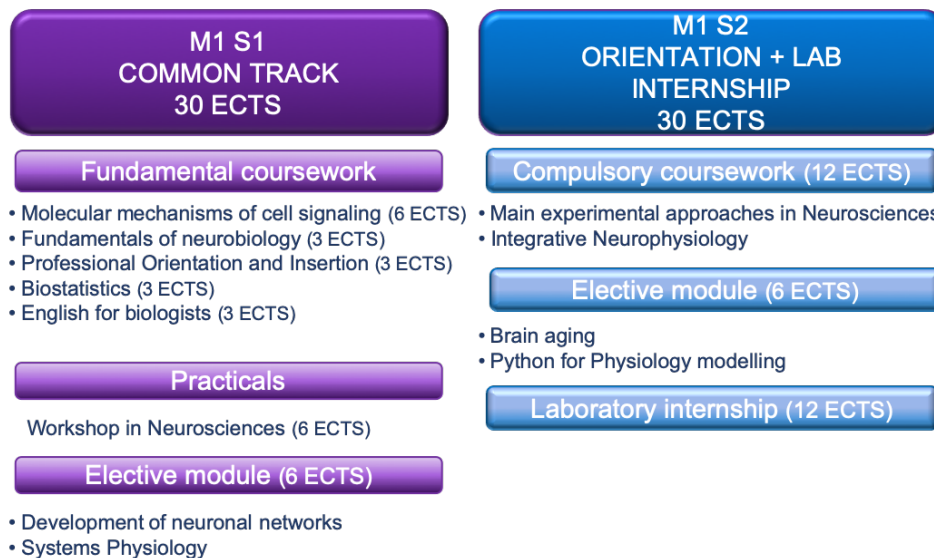
MASTERS STUDIES IN NEUROSCIENCE AT SORBONNE UNIVERSITÉ

Training in the Master BIP – Neuroscience program helps students develop skills that transfer to other professions outside of the neuroscience field:

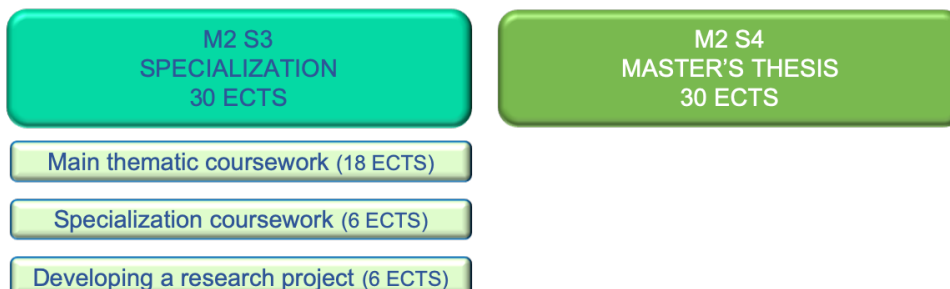
- *Project management*
- *Data management and analysis*
- *Scientific writing*
- *Presentation skills*
- *Entrepreneurship*
- *Developing scientific expertise*
- *Critical reading of the scientific literature*
- *Creativity...*

General organization:

The **first-year program (M1)** provides fundamental coursework with a progressive focusing on neuroscience:



The **second-year program (M2)** is designed to provide a unique opportunity for each student to acquire in depth theoretical and practical knowledge in their field of interest.



MASTERS STUDIES IN NEUROSCIENCE AT SORBONNE UNIVERSITÉ

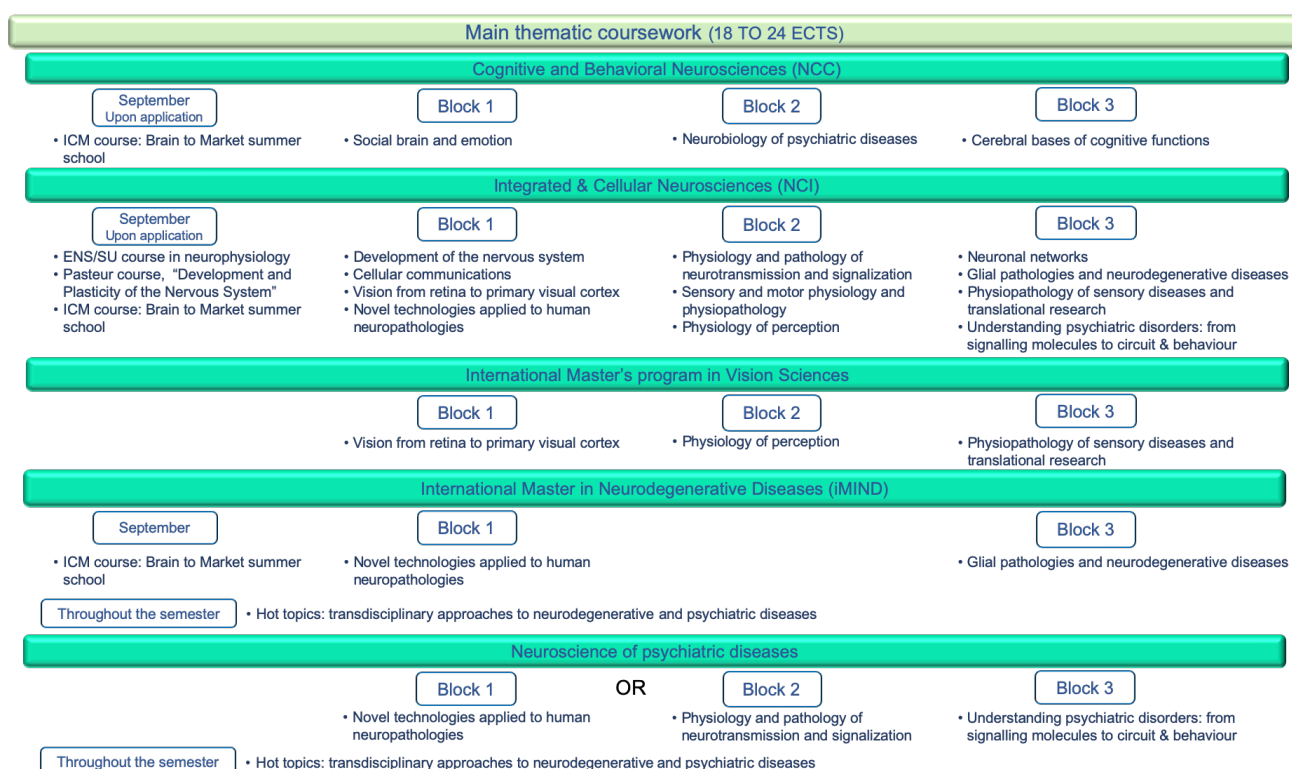
To help students organizing their training program, **5 thematic tracks** are proposed but courses from different tracks can be selected by each student to build his own personal curriculum:

- *cellular and integrative neuroscience*
- *cognitive and behavioral neuroscience*
- *vision science*
- *neurodegenerative diseases*
- *neurobiology of psychiatric diseases*

Each thematic track is based on suggested fundamental thematic coursework for a total of 18 ECTS.

Details of thematic track coursework:

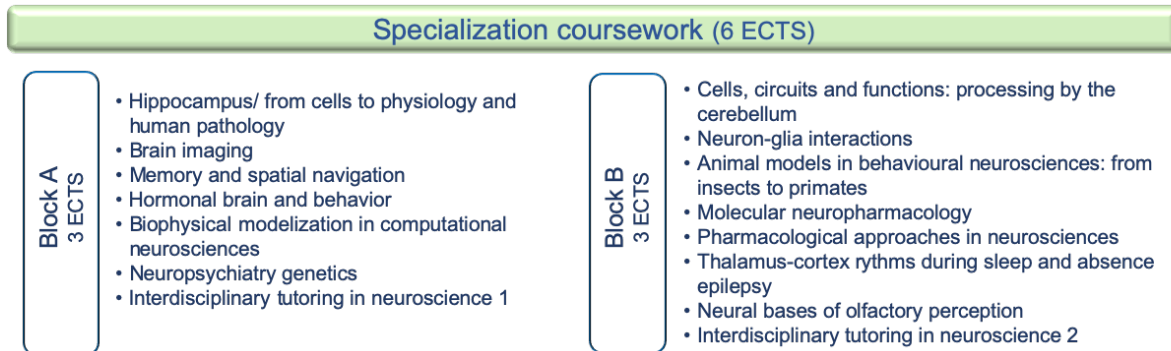
- *Most thematic coursework is taught in 2-week blocks in November and December (compatible with the schedule of medical interns)*
- *Some limited-enrollment courses (upon application), organized with the Ecole Normale Supérieure (ENS), Institut Pasteur and the Paris Brain Institute (ICM), are taught in September and October.*



MASTERS STUDIES IN NEUROSCIENCE AT SORBONNE UNIVERSITÉ

Details of specialization coursework:

- 2 series of one-week courses are taught in December and January. Each student chooses 1 course in each series.



Developing a research project:

This mandatory course is directly linked to the student's laboratory internship project. With the help of their internship supervisors, students describe, in a short written document and during an oral presentation, the design and feasibility of their experimental plan to answer the scientific question they will address during their lab internship. The developed research project will be undertaken, full-time, during the second semester.

Master's thesis:

- 5 to 6 month internship performed in an internationally renowned research laboratory in France or abroad (financial support is available at the Master and University levels to help student mobility).
- The M2 research project is a professional experience that allows students to acquire scientific and technical expertise in their specialities as well as general skills (ability to carry out a project, to research and analyse information, to work in a team, to display creativity and critical thinking, to present information in a written and/or oral form ...) also valuable in non-research contexts.
- List of projects proposed by French and foreign laboratories regularly participating in our formation is available on our website but students can also submit their application to other research teams that work in their field of interest.
- At the end of the internship a written and oral dissertation is defended in front of a jury in June or September.

International programs:

The Master BIP-Neuroscience has developed close collaborations with prestigious foreign partners (**University College London, Trinity College Dublin, National Autonomous University of Mexico, Indian Institute of Technology Delhi**) to construct **3 international programs**.

MASTERS STUDIES IN NEUROSCIENCE AT SORBONNE UNIVERSITÉ

Students interested are encouraged to directly contact people in charge of the programs for further details (for contacts see [Management of the Master BIP-Neuroscience](#))

Dual Master in Brain and Mind Sciences (admission before the M1 year):

- The Dual Master in Brain and Mind sciences is an international 2-years program, offered by **University College London and Sorbonne Université**, in **collaboration with the Ecole Normale Supérieure**.
- Students choose from a large number of courses proposed by each of the three prestigious partners.
- The first year is spent in London and the second year in Paris, with a research project to be carried in each city. Students graduate with a **Masters degree from UCL** after completion of the first year, **and with a Masters diploma from Sorbonne Université** after completion of the second year.

International Master in Neurodegenerative Diseases (iMIND):

- iMIND, developed in **collaboration with the Institut du Cerveau et de la Moelle Epinière (ICM)**, is focused on **neurodegenerative diseases**.
- iMIND is partnering with the **Trinity College Dublin** and **University of Heidelberg**.
- Master's internships of the first and/or second years can be performed in the institutes affiliated to the program (a list of participating laboratories is available in our website).
- one/ two full semesters of studies in one of our foreign partners can be implemented for students integrating the program in the first year.

International Master in Vision Science

- This program, developed in **collaboration with the Institut de la Vision (IDV)**, is dedicated to the study of **visual function** in humans, animals or computational models.
- It gives opportunities to follow one/two full semesters of study and/or to perform internships in the **Universidad Nacional Autonoma de Mexico (UNAM)**.
- Students validating two semesters in our partner university graduate with a **Master degree from UNAM** and a **Master degree from Sorbonne University**.

Management of the Master BIP-Neuroscience

Director of the Master BIP-Neuroscience:



Ann Lohof

Administrative manager:







MASTERS STUDIES IN NEUROSCIENCE AT SORBONNE UNIVERSITÉ






Véronique de Surirey

- 33 1 44 27 23 81

Thematic:

- *Cellular and Integrative Neuroscience:*  [Stéphanie Daumas](#)
[Richard Belvindrah](#)
- *Cognitive and Behavioral Neuroscience:*  [Philippe Fossati](#)
- *Vision Sciences:*  [Gregory Gauvain](#)
- *Neurodegenerative Diseases:*  [Hélène Cheval](#)
- *Neurobiology of Psychiatric Diseases*  [Sandrine Betuing](#)
 [Peter Vanhoutte](#)

International programs :

- *Dual Master in Brain and Mind Sciences:*  [Ann Lohof](#)
- *International Master in Neurodegenerative Diseases:*  [Hélène Cheval](#)
- *International Master in Vision Science:*  [Gregory Gauvain](#)

Main tracks: NCI and NCC

Cellular and Integrated Neurosciences - NCI

Most courses in English

Upon application

MU5BIN10 - ENS/SU course in neurophysiology (12 ECTS)

MU5BIN09 - Pasteur Development and Plasticity of the Nervous System (12 ECTS)

MU5BIN15 - ICM course: Brain to Market summer school (6 ECTS)

Block 1

MU5BIN02 - Development of the nervous system (6 ECTS)

MU5BIN03 - Cellular communications (6 ECTS)

MU5BINV1 - Vision from retina to primary visual cortex (6 ECTS)

MU5BIN18 - Novel technologies applied to human neuropathologies (6 ECTS)

Block 2

MU5BIN06 - Neurotransmission and Signaling in Health and Disease (6 ECTS)

MU5BIN05 - Physiologie et physiopathologie sensorielle et motrice (6 ECTS)

MU5BIN20 - Physiology of perception (6 ECTS)

Block 3

MU5BIN04 - Neuronal networks (6 ECTS)

MU5BIN07 - Glial pathologies and neurodegenerative diseases (6 ECTS)

MU5BIN21 - Physiopathology of sensory diseases and translational research (6 ECTS)

MU5BIN25 - Understanding psychiatric disorders: from signalling molecules to circuit & behaviour (6 ECTS)

Cognitive and Behavioral Neurosciences - NCC

All courses in French

Upon application

MU5BIN15 - ICM course: Brain to Market summer school (6 ECTS)

Block 1

MU5BIN11 - Cerveau social et émotion (6 ECTS)

Block 2

MU5BIN13 - Neurobiologie des troubles psychiatriques (6 ECTS)

Block 3

MU5BIN12 - Bases cérébrales des fonctions cognitives (6 ECTS)

- Most thematic coursework is taught in 2-week blocks in November and December (compatible with the schedule of medical interns).
- The limited-enrollment course (upon application), organized with the Institut du Cerveau (ICM, Paris Brain Institute), is taught in September.

Tracks with specific themes (all courses in English)

Neurodegenerative Diseases - iMIND International

Upon application	Block 1		Block 3
MU5BIN15 - ICM course: Brain to Market summer school (6 ECTS)	MU5BIN18 - Novel technologies applied to human neuropathologies (6 ECTS)		MU5BIN07 - Glial pathologies and neurodegenerative diseases (6 ECTS)
Throughout the semester	MU5BIN22 - Hot topics: transdisciplinary approaches to neurodegenerative and psychiatric diseases (6 ECTS)		

- Most thematic coursework is taught in 2-week blocks in November and December (compatible with the schedule of medical interns)
- The limited-enrollment course (upon application), organized with the Institut du Cerveau (ICM, Paris Brain Institute), is taught in September.

Neuroscience of Psychiatric Diseases - NMP International

	Block 1	Block 2	Block 3
	MU5BIN18 - Novel technologies applied to human neuropathologies (6 ECTS)	MU5BIN06 - Physiological and pathological neurotransmission and signalisation (6 ECTS)	MU5BIN25 - Understanding psychiatric disorders: from signalling molecules to circuit & behaviour (6 ECTS)
Throughout the semester	MU5BIN22 - Hot topics: transdisciplinary approaches to neurodegenerative and psychiatric diseases (6 ECTS)		

- Most thematic coursework is taught in 2-week blocks in November and December (compatible with the schedule of medical interns).

Vision Sciences - iMOV International

	Block 1	Block 2	Block 3
	MU5BINV1 - Vision from retina to primary visual cortex (6 ECTS)	MU5BIN20 - Physiology of perception (6 ECTS)	MU5BIN21 - Physiopathology of sensory diseases and translational research (6 ECTS)

- Thematic coursework are taught in 2-week blocks in November and December (compatible with the schedule of medical interns).

December courses - MU5BIN16

Enrolling in the [Tutorat of the nervous system](#) (6 ECTS) replaces any module of **MU5BIN16** and **MU5BIN17**

MU5BIN16 : 7 modules (3 ECTS each) and the tutorat (6 ECTS)

You must choose one module among the list below.

Upon application, some students can replace the modules of both December and January by the **tutorat of the nervous system**, running throughout the semester or by the [Hot Topics](#) for the PIM iMIND students).

- [MU5BIN16 Modèles animaux en neurosciences comportementales : de l'insecte aux primates](#)

- [MU5BIN16 Cells, Circuits and Functions How multimodal information processing of the Cerebellum influences behavior \(anglais\)](#)

- [MU5BIN16 Cerveau hormonal et comportements](#)

- [MU5BIN16 Hippocampus: from cells to physiology and human pathology \(anglais\)](#)

- [MU5BIN16 Imagerie cérébrale](#)

- [MU5BIN16 New methods for behavioral & cognitive explorations: Applications to neurodegenerative diseases \(anglais\)](#)

- [MU5BIN16 Olfaction: approches multidisciplinaires en neurosciences](#)

December courses - MU5BIN17

Enrolling in the [Tutorat of the nervous system](#) (6 ECTS) replaces any module of **MU5BIN17** and **MU5BIN16**

MU5BIN17 : 6 modules (3 ECTS each) and the tutorat (6 ECTS)

You must choose one module among the list below.

Upon application, some students can replace the modules of both December and January by the **tutorat of the nervous system**, running throughout the semester or by the [Hot Topics](#) for the PIM iMIND students).

- [MU5BIN17 Mémoire et navigation spatiale](#)

- [MU5BIN17 Neuron-Glia Interactions \(anglais\)](#)

- [MU5BIN17 Neuropsychiatry genetics \(anglais\)](#)

- [MU5BIN17 Pharmacological approaches in neurosciences \(anglais\)](#)

- [MU5BIN17 Rythmes thalamo-corticaux du sommeil et de l'épilepsie-absence](#)

- [MU5BIN17 Modelisation Biophysique en neurosciences computationnelles](#)

Teaching Units in English

(see also «Restricted enrollment Teaching Units »)

- MU5BIN02 Development of the Nervous System
 - MU5BIN03 Cellular Communications
 - MU5BIN04 Neuronal Networks
 - MU5BIN06 Neurotransmission and Signalling in Health and Disease
 - MU5BIN07 Glial Pathologies and neurodegenerative diseases
 - MU5BIN18 Novel technologies applied to human neuropathologies
 - MU5BINV1 Vision from retina to primary visual cortex
 - MU5BIN20 Neurophysiology of perception
 - MU5BIN21 Physiopathology of sensory diseases and translationnal research
 - MU5BIN25 Understanding psychiatric disorders: from signalling molecules to circuit & behaviour
-
- MU5BIN16 Ouverture thématique 1– some module options
 - MU5BIN17 Ouverture thématique 2 – some module options

This module will introduce students to the main events during the development of the nervous system, as well as the experimental model organisms used to study these events.

Researchers working directly in the field provide the lectures, using primary scientific literature to illustrate the different topics. Cellular and molecular interactions are presented, as well as the resulting mature neuronal networks.

Topics presented :

- Introduction to early neural development
- Brain Regionalization
- Neuronal Migration
- Transcriptional control of neuronal specification
- Cortical development and epilepsy
- Neuronal and Glial Specification,
- Neurogenesis
- Axon guidance
- Wiring the zebrafish,
- Stem cells (ES and iPS)
- Axonal Regeneration
- Synaptogenesis and synaptic elimination
- Development and plasticity of the visual system,
- Adult Neurogenesis,

Prerequisites:

Prior academic studies in Biology, Medicine, or Neurosciences, at the M1 level.

Learning goals:

- Apply previous knowledge in biology and physiology to nervous system development.
- Understanding basic cellular interactions and molecular signalling events involved in nervous system development
- Understanding the main technical approaches, and conceptual tools, used to study and interpret these events
- Critical analysis of scientific literature in the field of nervous system development.
- Understanding experimental planning and necessary controls
- Evaluating validity of different scientific approaches

Practical information:

6 ECTS

Grading:

- Oral presentation : 50/100
- Written exam : 50/100

Course hours: 34h lectures

Course coordinators:

Dr Richard Belvindrah (richard.belvindrah@sorbonne-universite.fr)

Dr Alexandra Rebsam (alexandra.rebsam@inserm.fr)

Week 1 Lieu : Campus Jussieu

	Monday October 30	Tuesday October 31	Wednesday November 1	Thursday November 2	Friday November 3
	<i>Salle 24.34.102</i>	<i>Salle 24.34.104</i>		<i>Salle 24.34.110</i>	<i>Salle 24.34.202</i>
10h	Presentation and distribution of articles for Nov 10 (9h30-10h30)	Neurogenesis in Drosophila Michel Gho (10h45-12h45)	<i>Holiday</i>	Neuronal and Glial Specification Carlos Parras (10h45-12h45)	Axonal Regeneration Sylvia Soares (10h45-12h45)
11h					
12h	Introduction to early neural development Nicolas Narboux-Nême (10h30-12h30)				
13h		<i>Salle 24.34.104</i>		<i>Salle 24.34.110</i>	<i>Salle 24.34.202</i>
14h		Brain Regionalization Philippe Vernier (13h45-15h45)		Synaptogenesis et synaptic elimination Fekrije Selimi (13h45-15h45)	Transcriptional control of neuronal specification in <i>C. elegans</i> Vincent Bertrand (13h45-15h45)
15h		PAUSE		PAUSE	PAUSE
16h		Glial development during circuit assembly in Drosophila Iris Salecker (16h-18h)		Neuronal Migration Melody Atkins (16h-18h)	Cortical development and epilepsy Fiona Francis (16h-18h)
17h					
18h					

Week 2 Lieu : Campus Jussieu

	Monday November 6	Tuesday November 7	Wednesday November 8	Thursday November 9	Friday November 10
	<i>Salle 23.24.105</i>	<i>Salle 24.34.312</i>	<i>Salle 24.34.304</i>		<i>Salle 23.24.112</i>
10h					Student presentations
11h					
12h	Axon guidance Julien Ferent (10h45-12h45)	Cortical fate mapping Frédéric Causeret (10h45-12h45)	Development and plasticity of the visual system Alexandra Rebsam (10h45-12h45)		
13h					
14h	<i>Salle 23.24.105</i>	<i>Salle 24.34.312</i>	<i>Salle 24.34.304</i>		
15h	Stem cells and spinal cord Stéphane Nedelec (13h45-15h45)	Immunology, microglia and neurodevelopment Corentin Le Magueresse (13h45-15h45)	Adult Neurogenesis Sophie Scotto-Lomassese (13h45-15h45)		
16h		PAUSE			
17h		<i>Salle 14.15.105</i>			
18h		Wiring the zebrafish Jamié Hazan (16-18h)			

The nervous system of vertebrates has developed many specific mechanisms for generating and processing information. This UE presents in detail a few selected examples to illustrate a large part of cellular communication processes. It thus covers aspects of signal integration from the molecular to the cellular and neural network levels.

Transporters - SNARE proteins - Operation of excitatory synapses - Operation of inhibitory synapses - LTD in Purkinje cells - Plasticity of inhibitory synapses - The dynamic synapse – Metabotropic receptors and synapses - Synaptic integration - Dynamics of second intracellular messengers and modulation of neuronal properties - Glial cells and neuron-glia interactions - The glycinergic system - Roles of calcium channels in pain pathophysiology – Functional plasticity in the spinal nociceptive system - Introduction to the theory of encoding/decoding information at the neuronal level ...

Prerequisites:

Prior academic studies in Biology, Medicine, or Neurosciences, at the M1 level.

Learning goals:

- Gain the most recent knowledge in neuronal communication.
- Acquire the methodological procedures to answer a specific scientific issue.
- Develop critical thinking regarding an experimental design, results and literature.
- Develop analysis and synthesis skills.

Practical information:

6 ECTS

Grading:

- Written exam : 100/100

Course hours: 28h lectures

Course coordinator:

Pr Régis Lambert (regis.lambert@sorbonne-universite.fr)

MU5BIN03 Cellular Communications – Bloc 1

Campus JUSSIÉU		lundi 30-oct	mardi 31-oct	mercredi 01-nov	jeudi 02-nov	vendredi 03-nov	WE
8h30							
10h30							
10h45				<p>présentation de l'UE & R. LAMBERT Synaptic integration Salle 24.34.112</p>		<p>V. CHEVALEYRE Synaptic plasticity of inhibitory transmission Salle 24.34.102</p>	
12h45							
13h45				<p>S. DIEUDONNE Inhibitory synapses : from molecules to networks Salle 24.34.112</p>		<p>B. BARBOUR Receptor activation Salle 24.34.102</p>	
15h45							
16h							
18h							

Campus JUSSIÉU		lundi 06-nov	mardi 07-nov	mercredi 08-nov	jeudi 09-nov	vendredi 10-nov
8h30						
10h30						
10h45	<p>M. CASADO From funny molecular events to bidirectional plasticity at a cerebellar synapse. Salle 55.65.102</p>	<p>M. RENNER The dynamic synapse Salle 13.14.102</p>	<p>L. DANGLOT SNAREs proteins and exocytosis Salle 24.34.104</p>	<p>R. Brasselet Introduction to coding and decoding in neurons Salle 14.15.103</p>		
12h45						
13h45	<p>L. TRICOIRE Metabotropic glutamate receptors and synapses Salle 14.15.108</p>	<p>P. LEGENDRE Glycinergic system Salle 13.14.102</p>	<p>E. BOURINET Calcium channels and pain Salle 24.34.104</p>	<p>B. GASNIER Role of neurotransmitter transporters in synaptic signaling and neurometabolic coupling Salle 14.24.208</p>	<p>P. VINCENT Dynamics of neuromodulatory signal integration. Salle 23.24.212</p>	
15h45						

This module is about information processing mediated by neural networks. It focuses on the mechanisms underlying multisensory integration, neural coding, and memory formation/retrieval. It presents the multidisciplinary approaches set forth to investigate those topics, by illustrating the most recent developments in both experimental and theoretical research.

The module is organized around a series of lectures and workshops, dealing with the neuronal mechanisms involved in the representation and storage of information. The emphasis is on the mechanisms mediating multi-scale adaptation of neuronal representations of the external world and the encoding of short- and long-term memories. Another key aspect concerns the general nature of the solutions implemented by the brain to optimize the action-perception loop.

Prerequisites:

Basic knowledge about neuronal excitability

Learning goals:

The conceptual and methodological knowledge provided by courses is centred on integrative neurobiology. This module aims at showing the importance of combining experimental approaches (e.g., electrophysiology, behaviour, neuroimaging) and computational approaches (e.g., mathematical neuroscience, numerical simulations) for the study of neural network dynamics and their roles in the coding of information.

Practical information:

6 ECTS

Grading:

- Written exam : 100/100

Course hours: 28h lectures

Course coordinators:

Denis Sheynikhovich (denis.sheynikhovich@sorbonne-universite.fr)

Thomas Bessaïh (thomas.bessaïh@sorbonne-universite.fr)

MU5BIN04 Neuronal Networks– Bloc 3

MU5BIN04 - Neural Networks 2023-24

		November the 27th 2023	November the 28th 2023	November the 29th 2023	November the 30th 2023	December the 1st 2023
		Monday	Tuesday	Wednesday	Thursday	Friday
09:00		Thomas Bessaih	Sandrine Duverne	Benoit Girard	Eric Burguiere	
to		Cellular and network mechanisms underlying feature selectivity in sensory cortices	Information processing by the prefrontal cortex for decision making	Action selection & Reinforcement Learning in the Basal Ganglia for Animals & Robots	Introduction to optogenetics	No lecture
12:00		Salle 24.34.112	Salle 24.34.303	Salle 24.34.210	Salle 24.25.103	
14:00		Michael Zugaro	Martin Giurfa		Brice Bathellier	Alain Destexhe et Thierry Bal
to		From models to experiments: fast neural sequences in the hippocampus for episodic-like memory. (Nb: this lecture will start at 10 am)	Neural circuits involved in associative learning	No lecture	Sensory coding in neural assemblies: examples for the olfactory and auditory systems	Synaptic noise and its impact on the properties of thalamocortical neurons
17:00		Salle 24.34.112	Salle 24.34.303		Salle 24.25.103	Salle 24.34.102
		December the 4th 2023	December the 5th 2023	December the 6th 2023	December the 7th 2023	December the 8th 2023
		Monday	Tuesday	Wednesday	Thursday	Friday
09:00		Ricardo CHAVARRIAGA	Karim Benchenane	Clément Léna	Stéphane Charpier	Romain Brasselet
to		Introduction to brain-computer interfaces	Importance of rhythms for the synchronisation of neuronal assemblies	Role and physiology of the cerebellum	Intrinsic plasticity: experimental evidence and function	Decoding neuronal populations: information theory and decoding approaches
12:00		Salle 13.14.107	Salle 23.24.212	Salle 24.34.210	Salle 24.25.103	Salle 24.34.104
14:00		Régis Lambert	Pascal Mamassian	Simon Thopes	Marcel Simberg	Denis Sheynikhovich
to		From experiments to models	Psychophysics of visual perception	Neural bases of rapid visual information processing. (Nb: this lecture will be held via zoom)	Simulating neuronal computation and information processing	Neurocomputational bases of spatial memory and behavior sensory coding in neural assemblies: examples for the olfactory and auditory systems
17:00		Salle 13.14.107	Salle 23.24.212		Salle micro 229	Salle 24.34.104

MU5BIN06 Neurotransmission and Signalling in Health and Disease– **Bloc 2**

This UE aims at providing a global vision of the signaling of different neuromodulators and neurotransmitters: 1) by presenting receptors (mainly, but not exclusively, GPCRs) and their signaling, as well as evolutionary aspects of signaling ; 2) by exploring cellular functions which can impact on signaling (trafficking, transport across membranes, kinases and phosphatases, structure-function relationship...), 3) by showing signaling alterations in pathologies. The speakers have been chosen to also show the diversity of experimental approaches in neuroscience. This is complemented by student presentations (which all of them must attend) of recent articles each illustrating a specific innovative technique.

Topics addressed : Signaling (dopamine, endocannabinoids, acetylcholine, serotonin, GABA...); transporters ; structure/function of receptors; trafficking and diffusion of receptors ; regulation of transcription ; glia and signaling ; evolution of GPCR and of their coupling; proteomic and transcriptomic approaches. Pathologies: Parkinson, Huntington, bipolar disorders, depression, addiction...

Prerequisites:

Background in cell biology, interest for intracellular signaling, and for approaches at the cellular and molecular level.

Learning goals:

- Seminars → become familiar with concepts and techniques necessary for the experimental practice of neurobiology
- Article presentations → make an oral presentation, provide an update on a technique, be didactic (cf article presentation in groups of 2 or 3)
- Critical analysis of scientific literature (seminars, oral presentation)

Practical information:

6 ECTS

Grading:

- Oral presentation : 50/100
- Written exam : 50/100

Course hours: 40h lectures

Course coordinators:

Anne Roumier (anne.roumier-dauteloup@sorbonne-universite.fr)
Jean-Antoine Girault (Jean-antoine.girault@inserm.fr)

MU5BIN06 Neurotransmission and Signalling in Health and Disease– **Bloc 2**

1st week:							
	Morning				Afternoon		
Mon. Nov 13 :				13h15-14h00	Introduction on Neurotransmission and Signaling - JAG/AR	14h30-16h30	L. Bellocchio – Endocannabinoids, mouse genetics
Tue. Nov 14 :	10h-12h	<i>time for the preparation of oral presentations</i>		13h30-15h30	JA Girault – Protein phosphorylation and intracellular signaling	16h-18h	Marianne Renner - Structure and dynamics of excitatory and inhibitory synapses in the CNS
Wed. Nov 15 :	10h-12h	<i>time for the preparation of oral presentations</i>		13h30-15h30	JP Pin - Dimerisation of GPCRs	16h-18h	F. Tronche - Regulation of gene expression in the brain
Thu. Nov 16 :		<i>time for the preparation of oral presentations</i>		13h30-15h30	S. Jamain – Genetics of psychiatric disorders	16h-18h	E. Formstecher - Local and global protein-prot. interaction mapping ; application to neuroscience.
Fri. Nov 17 :	10h-12h	L. Maroteaux - Serotonin signaling, Addiction and Depression		13h30-15h30	JA. Girault – Physiology and Pathology of Dopamine signaling	16h-18h	<i>time for the preparation of oral presentations</i>

2nd week:							
	Morning				Afternoon		
Mon. Nov 20 :		<i>time for the preparation of oral presentations</i>		13h30-15h30	P. Marin – Neuroproteomics	16h-18h	PJ. Corringer - Nicotinic acetylcholine receptors and their homologs – structure and function
Tue. Nov 21 :	10h-12h	<i>time for the preparation of oral presentations</i>		13h30-15h30	S. Humbert – Huntington’s disease	16h-18h	A.Roumier – Microglia and Neurotransmission
Wed. Nov 22 :	10h-12h	<i>time for the preparation of oral presentations</i>		13h30-15h30	S. Birman - <i>Drosophila</i> in the study of behaviour and neurodegeneration	16h-18h	JC. Corvol – Genetics of Behavioral Addiction in Parkinson’s disease
Thu. Nov 23 :	10h-12h	<i>time for the preparation of oral presentations</i>		13h30-15h30	Article presentations by students	16h-18h	Article presentations by students
Fri. Nov 24 :	10h-12h	P. Vernier – Gene families in neurotransmission: Duplication and evolution - The example of dopamine neurotransmission		13h30-15h30	Article presentations by students	16h-18h	Article presentations by students

MU5BIN07 Glial Pathologies and Neurodegenerative Diseases– **Bloc 3**

The goal of this course is to provide an understanding of the mechanisms of neurodegenerative diseases such as Alzheimer's, Parkinson's, and Huntington's disease as well as insight into neuronal cell death, genetics and existing treatments. This course will also focus on the various physiological roles that different glial cells play and the pathologies that are associated with them.

Prerequisites:

A master 1 level in neurosciences or equivalent is required.

Learning goals:

- ✓ Understand some of the techniques for developing new treatments for neurodegenerative pathologies
- ✓ Gain information on different types of glial cells and their functioning
- ✓ Understand the physiopathology involved in diseases related to glial cells (for example multiple sclerosis, peripheral neuropathy, glial tumours)
- ✓ Understand some of the therapeutic strategies for treating glial cell-related disorders
- ✓ Learn how to critically analyse neuroscience literature

Practical information:

6 ECTS

Grading:

- Written exam : 100/100

Course hours: 40h lectures

Course coordinators:

Jean-Christophe Corvol (jean-christophe.corvol@aphp.fr)

Ahmed Idbaih (ahmed.idbaih@aphp.fr)

MU5BIN07 Glial Pathologies and Neurodegenerative Diseases – Bloc 3

Horaires : Orateur 1 : 14h00 - 15h00 – Orateur 2 : 15h15 - 16h15 – Orateur 3 : 16h30 – 17h30

Module 1 : Cellules Souches Neurales, Cellules Myélinisantes du Système Nerveux Central

Lundi 27/11/2023

SALLE 14.24.107 - JUSSIEU

Oligodendrocytes : origine, développement
Myélinisation
Cellules microgliales et macrophagique et pathologie démyélinisantes centrales

B Zalc
B Zalc
A Desmazieres

Module 2 : Astrocytes, Tumorigenèse Gliale

Mardi 28/11/2023

SALLE 24.34.309 - JUSSIEU

Astrocytes : développement, fonctions
Tumorigenèse gliale : aspects moléculaires, rôle des cellules souches

D Mozheiko
M Touat

Module 3 : Sclérose en Plaques et Modèles Expérimentaux

Mercredi 29/11/2023

SALLE 1-2 - ICM

Modèles expérimentaux de la sclérose en plaques et stratégies de remyélinisation
Pathologie inflammatoire de la myéline : la sclérose en plaques

B Nait Oumesmar
C Louapre

Module 4 : Cellules Myélinisantes du Système Nerveux Périphérique

Jeudi 30/11/2023

SALLE 1-2 - ICM

Les neuropathies démyélinisantes héréditaires : de la maladie de Charcot-Marie-Tooth aux formes complexes
Cellules de Schwann : développement et Neurofibromatose de type 1

T Stojkovic
P Topilko

Module 5 : Cellules Microgliales

Vendredi 01/12/2023

SALLE 54.55.201 - JUSSIEU

Cellules souches neurales
Cellules microgliales : différenciation et fonctions au cours du développement

N Spassky
M Mallat

Lundi 04/12/2023

SALLE 24.34.307 - JUSSIEU

Mécanismes et conséquences de la mort neuronale dans la maladie de Parkinson
Que peut-on apprendre de la mort neuronale à partir des formes familiales de maladie de Parkinson ?

E Hirsch
O Corti

Mardi 05/12/2023

SALLE 56.66.103 - JUSSIEU

Réactions gliales et inflammatoires dans la maladie de Parkinson
Processing et accumulation de protéines dans la maladie d'Alzheimer

S Hunot
B Delatour

Mercredi 06/12/2023

SALLE 24.34.301 - JUSSIEU

Maladies prions et prion like
Nouveaux développements thérapeutiques pour la maladie d'Alzheimer

S Haik
N Sergeant

Jeudi 07/12/2023

AMPHI 45B - JUSSIEU

Implication des cellules immunitaires dans la Sclérose Latérale Amyotrophique
Maladie de Huntington : modèles expérimentaux pour l'étude de la fonction/dysfonction de la huntingtine

S Boillée
S Humbert

Vendredi 08/12/2023

SALLE 56.66.111 - JUSSIEU

Utilisation de C elegans comme modèle d'étude des maladies neurodégénératives
Génétique Humaine des formes héréditaires de démences

C Neri
M Barbier

The purpose of this course is to introduce the different approaches used to study the early visual system, with a focus on development, physiology and modeling from the retina to the primary visual cortex.

Eminent specialist will introduce the students to their research thematic, among which: eye anatomy, phototransduction, development of the early visual system, functional organization of retinal circuit and retinal signaling, physiology and computational modeling of information processing in the early visual system.

This course will also put a particular emphasis on the state-of-the-art tools used to study neural circuits (multi-electrode recordings, spike sorting, multiphotonic imaging and light shaping).

Prerequisites:

Basic knowledge in Neurosciences

Learning goals:

Students will learn about different experimental techniques, as well as computational tools, and how they can be used and combined to study how the visual system process and extract the information contained in the visual scene.

This course will provide the essential knowledge about the early visual system. It will emphasize the diversity of tools, concepts and technologies used for its study. Most of these tools are also relevant to study other neural circuits. As such, the content presented during this course will also be useful for students interested in other parts of the brain.

Practical information:

6 ECTS

Grading:

- 1 oral presentation (50% of the mark)
- 1 written exam (50% of the mark)

Course hours: 30h lectures

Course coordinators:

Dr Grégory Gauvain (gregory.gauvain@sorbonne-universite.fr)

Dr Gaël Orioux (gael.orieux@sorbonne-universite.fr)

iMOV
NCI

MU5BINV1 Vision, from retina to primary visual cortex—

Bloc 1

- Schedule to come

The aim of this course is to present the latest results and current issues related to how sensory cortices process information, and how this gives rise to perception. The emphasis will be on vision, although other modalities will also be discussed. The variety of approaches used to tackle these issues will be presented, ranging from the study of cortical circuits with state of the art tools, to the more integrated level of human psychophysics and animal behaviors.

Different research thematic will be covered: functional exploration of the visual cortex and its plasticity, interaction between visual cortex and other cognitive areas, neuropsychological correlates of perception, cross modal interaction between different sensory modalities, relations between cortical activity and perception such as object, face or space perception, and visual psychophysics.

Prerequisites:

Basic knowledge in Neurosciences

Learning goals:

Students will learn how the visual system is organized and processes information, the prominent role of cortical integration in behavior initiation will be explored, especially the role of attention in decision making. Emphasis will be given on state of the art imaging technique as well as exploration of visual behavior, their use in the study of visual system processing, and the concepts and tools that can be used to bridge the gap between neural activity and perception.

Practical information:

6 ECTS

Grading:

- 1 oral presentation (50% of the mark)
- 1 written exam (50% of the mark)

Course hours: 30h lectures

Course coordinators:

Dr Grégory Gouvain (gregory.gouvain@sorbonne-universite.fr)

Dr Olivier Marre (olivier.marre@inserm.fr)

Monday 13/11/2023	10h-12h	conference room - IDV Intro to vision (G. Gauvain)	14h-16h	Salle schiff Image Forming in the retina, what the eye tell to the Brain (G. Gauvain)
Tuesday 14/11/2023	10h-12h	conference room - IDV V1 plasticity (G. Gauvain)	14h-16h	conference room - IDV Face recognition. (B. Rossion)
Wednesday 15/11/2023	10h-12h	SU - 23.24.204	14h-16h	conference room - IDV Attention: Psychophysics. (L. Dugué)
Thursday 16/11/2023	10h-12h	SU - 23.24.204	14h-16h	SU - 23.24.204
Friday 17/11/2023	10h-12h	conference room - IDV visual system ; from LGN to V1 /1 (C. Monier)	14h-16h	conference room - IDV visual system ; from LGN to V1 /2 (C. Monier)
Monday 20/11/2023	10h-12h	amphi Baillart visual signal treatment in LGN/V1; a computational approach (M. Chalk)	14h-16h	amphi Baillart Attention: Physiology (F. Arcizet)
Tuesday 21/11/2023	10h-12h	amphi Baillart Psychophysics, perception and decision making, Bayesian concepts. (P. Mamassian)	14h-16h	conference room - IDV
Wednesday 22/11/2023	10h30-12h30	amphi Baillart Physiology of visual cortex. (F. Chavane)	14h-17h	conference room - IDV Atelier Débat : Correlates between physiology and perception (F. Chavane, S. El Boustani, O. Marre)
Thursday 23/11/2023	10h-12h	amphi Baillart Multi-modality. (B. Bathellier)	14h-16h	
Friday 24/11/2023	09h30-12h30	conference room - IDV Présentations Orales	14h-16h	

MU5BIN21 Physiopathology of Sensory Diseases and Translational research– **Bloc 3**

This course aims at giving an overview of the different pathological contexts leading to sensory defects. The physiological conditions of the diseases will be explored with an emphasis on how research advances can lead to therapeutic progress.

Neuropathology of the various diseases affecting vision will be addressed: age-related macular degeneration, retinitis pigmentosa, dystrophies and other retinal diseases, glaucoma, corneal diseases, Usher syndrome, aging. New therapeutic avenues will be considered: cell therapy, gene therapy, implants, medical devices. Finally, handicap evaluation and rehabilitation techniques will be addressed.

Prerequisites:

Basic knowledge in Neurosciences

Learning goals:

Thanks to the involvement of contributors from academic research, clinical medicine or the industry, participants will gain an understanding in the translational process underlining the transition from fundamental research to the development of therapeutic advances. Furthermore, this course is particularly suited for students that wish to acquire knowledge on the specific challenges that bring forth the physiopathology of sensory diseases.

Practical information:

6 ECTS

Grading:

- 1 oral presentation (50% of the mark)
- 1 written exam (50% of the mark)

Course hours: 30h lectures

Course coordinators:

Dr Grégory Gauvain (gregory.gauvain@sorbonne-universite.fr)

Dr Gaël Orioux (gael.orieux@sorbonne-universite.fr)

MU5BIN21 Physiopathology of Sensory Diseases and Translational research– Bloc 3

Monday		conference room - IDV		Jussieu - 24.34.310
27/11/2023	10h-12h	Optic neuropathy and regeneration of the optic nerve (H. Nawabi)	13h45-15h45	Gene Therapy : vectorology. (E. Zin)
Tuesday		conference room - IDV		conference room - IDV
28/11/2023	10h-12h	Rétine dystrophie ; Thérapie génique ; maladies rares de la rétine (I. Audo)	14h-16h	Retinal pigmented epithelium : normal functions and role in retinal pathologies (E. Nandrot)
Wednesday		Jussieu - 14.15.103		Jussieu - 55.65.105
29/11/2023	10h45-12h45	progressive and stationnary retinal dystrophies : identification of associated genes (C. Zeitz)	13h45-15h45	Neuroplasticity in visual disorders: new therapies for adult amblyopia and sensory substitution (C. Lunghi)
Thursday				Jussieu - 14.24.103
30/11/2023	10h-12h		13h45-15h45	Retina stem cells and regeneration (M. Perron)
Friday				
01/12/2023	10h-12h	not applicable	14h-16h	not applicable
Monday		conference room - IDV		Jussieu - 14.24.206
04/12/2023	10h-12h	Application of human pluripotent stem cells for modeling and treating retinal diseases. (O. Goureau)	13h45-15h45	Transformation of PSC-derived RPE for vision restoration. (K. Ben M'Barek)
Tuesday		conference room - IDV		conference room - IDV
05/12/2023	10h-12h	Transcriptional Regulation for photoreceptor development and homeostasis (J. Roger)	14h-16h	Translational research on ocular surface diseases (A. Reaux Le Goazigo)
Wednesday		amphi Ballart		conference room - IDV
06/12/2023	10h-12h	Rétine, inflammation, DMLA, rétinopathies diabetiques. (C. Delarasse, X. Guillonneau & F. Sennlaub)	14h-16h	Vision restoration using prosthesis and optogenetic. (G. Gauvain)
Thursday		IDV frontdesk		
07/12/2023	10h-12h	Streetlab visit / simulating handicap	14h-16h	
Friday		conference room - IDV		
08/12/2023	9h30-12h	Présentations Orales (students not in PPH)	14h-16h	
Friday				conference room - IDV
15/12/2023	10h-12h		13h45-18h00	Présentations Orales (PPH students)

MU5BIN25 Understanding psychiatric disorders: from signalling molecules to circuit & behaviour- Bloc 3

The main goal of this course is to provide an overview of current approaches and methodologies to study the neurobiological bases of psychiatric diseases. Experts in this field will comprehensively present preclinical models used to identify cellular and molecular events underlying behavioral alterations that are reminiscent to psychiatric diseases in human. They will also describe a panel of up-to-date strategies to design brain-region- and cell-type-specific tools to progress in the understanding of psychiatric disorders and eventually overcome disease-related dysfunctions.

Prerequisites:

Knowledge of basic neurophysiology.

Learning goals:

Attending to this course will provide to students a solid background on cutting-edge approaches to dynamically study and/or manipulate neuronal circuits that are altered in a vast panel of psychiatric disorders. It will put forward the concept that studying the neurobiological correlates of psychiatric diseases is crucial, not only for a better understanding of the brain's (dys)functions, but also for the development of innovative strategies with a potential therapeutic value.

Practical information:

6 ECTS

Evaluation

- 1 oral presentation (40% of the mark)
- 1 written exam (60% of the mark)

Hours

30h of lectures

Course coordinators:

Dr. Peter Vanhoutte (peter.vanhoutte@sorbonne-universite.fr)

Pr Sandrine Betuing (sandrine.betuing@sorbonne-universite.fr)

MU5BIN25 Understanding psychiatric disorders: from signalling molecules to circuit & behaviour- Bloc 3

MU5BIN25					
Lieu : Campus Jussieu	LUNDI	MARDI	MERCREDI	JEUDI	VENDREDI
	27-nov	28-nov	29-nov	30-nov	01-déc
	<i>Salle 24.34.205</i>	<i>Salle 55.65.102</i>	<i>Salle 23.24.103</i>		<i>Salle 14.15.103</i>
MORNING	Jacques Barik 10h45-12h45	Vincent Pascoli - 10h45-12h45	Jean-Antoine Girault 10h45-12h45	Jacques Barik 10h45-12h45 ZOOM	Christiane Schreweis 10h45-12h45
	<i>Salle 24.34.204</i>		<i>Salle 23.24.103</i>	<i>Salle 13.14.102</i>	<i>Salle 24.34.202</i>
AFTERNOON	Peter Vanhoutte - 13h45-15h45	Marie-Charlotte	Jérémie Naude 13h45-16h45	Jocelyne Caboche 13h45-15h45	Eric Burguière 13h45-15h45

	LUNDI	MARDI	MERCREDI	JEUDI	VENDREDI
	04-déc	05-déc	06-déc	07-déc	08-déc
	<i>Salle 13.14.108</i>	<i>Salle 13.14.106</i>		<i>Salle 23.24.205</i>	<i>Salle 23.24.103</i>
MORNING	Pierre Trifilieff 10h45-12h45	Nicolas Heck 10h45-12h45		ORAL 9h-12h	Table ronde 10h45-12h45
	<i>Salle 13.14.108</i>	<i>Salle 13.14.102</i>		ORAL 13h30-16h30	
AFTERNOON	Sébastien Parneadeau 13h45-15h45	Sandrine Betuing 13h45 - 15h45			

Teaching Units in French

- MU5BIN05 Physiologie et physiopathologie sensorielle et motrice
- MUBIN11 Cerveau Social et Emotion
- MU5BIN12 Bases cérébrales des fonctions cognitives
- MU5BIN13 Neurobiologie des troubles psychiatriques
- MU5BIN16 Ouverture thématique 1– some module options
- MU5BIN17 Ouverture thématique 2 – some module options

Lieu des cours : Campus JUSSIEU

SEMAINE 1

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heures	Lundi 13/11	Mardi 14/11	Mercredi 15/11	Jeudi 16/11	Vendredi 17/11
8h30	B. DEGOS 8h30-12h30 Physiopathologie de la maladie de Parkinson, et effets et mécanismes d'action de la stimulation cérébrale profonde Salle 13.14.107	S. CHARPIER 8h30-10h30 Salle 24.34.303	J. YELNIK 8h30-10h30 Anatomie fonctionnelle des ganglions de la base Salle 24.34.112		
8h45					
9h					
9h15					
9h30					
9h45					
10h					
10h15					
10h30					
10h45					
11h	S. ESKIIZMIRLILER 13h45-16h45 Les modèles du contrôle moteur volontaire et applications dans le domaine de l'interface cerveau machine Salle 13.14.107		B. LAMOTTE D'INCAMPS 10h45-12h45 L'inhibition récurrente dans les circuits moteurs spinaux Salle 24.34.112	L. BOURGEOIS 10h45-12h45 Douleur : physiologie des voies ascendantes Salle 24.25.108	N. MOREAU 10h45-12h45 Douleur post-opératoire orale : aspects cliniques et neurobiologiques Salle 24.34.102
11h15					
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13h45				L. BOURGEOIS 13h45-15h45 Les voies modulatrices descendantes de la douleur Salle 24.25.108	
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SEMAINE 2

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heures	Lundi 20/11	Mardi 21/11	Mercredi 22/11	Jeudi 23/11	Vendredi 24/11
8h30	V. MARCHAND-PAUVERT 8h30-10h30 Motoneurones et Unités motrices Salle 13.14.108	M. VIDAIHET 8h30-10h30 Dystonie et tremblements Salle 14.24.316	Y. WORBE 8h30-10h30 Ganglions de la base et troubles neuro-psychiatriques: exemple du syndrome de Gilles de la Tourette Salle 14.24.208	A. LACKMY 8h30-10h30 Méthodes d'étude des circuits spinaux chez l'homme Salle 24.34.302	S. CHARPIER 9h30-12h30 Organisation, fonctions et plasticités du système corticostriatal Salle 24.25.105
8h45					
9h					
9h15					
9h30					
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10h					
10h15					
10h30					
10h45					
11h	V. MARCHAND-PAUVERT 10h45-12h45 Commande motrice descendante, système propriospinal cervical Salle 13.14.108	Y. BOUCHER 10h45-12h45 Douleurs trigéminales Salle 46.56.116	JM. MANGIN 10h45-12h45 Activité précoce des réseaux neuronaux et développement des réseaux spinaux Salle 14.24.208	S. PEZET 10h45-12h45 Influence du microbiote sur les mécanismes de la douleur Salle 24.34.302	
11h15					
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13h45	C. WYART 14h30-16h30 Les circuits de la locomotion. Dissection génétique des réseaux spinaux, outils optogénétiques Salle 13.14.108		S. PEZET 13h45-15h45 Mesure de la douleur chez l'animal, développement et validité des modèles animaux Salle 54.55.203	PP. VIDAL 13h45-15h45 Transformations sensori-motrices : un exemple, le contrôle du regard Amphi 55A	L. BOURGEOIS 13h45-15h45 mécanismes de la douleur neuropathique Salle 24.25.105
14h					
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16h30					

Lundi 30 octobre Salle 26, bât 105	10h 30-12h30	Présentation de l'UE	J. Nadel
	14h-17h	Neurosciences de l'interaction sociale : de l'hyperscanning aux modèles computationnels	G. Dumas
Mardi 31 octobre Salle 26, bât 105	10h30-12h 30	Le cerveau social : rôle du Sillon Temporal Supérieur	A. Saitovitch
	14h-17h	L'imitation, base comportementale d'accès à la cognition sociale	J. Nadel
Mercredi 1 ^{er} novembre	Férié		
	Férié		
Jeudi 2 novembre Salle 26, bât 105	9h30-12h30	De la perception sociale à la cognition sociale	J. Nadel
	14h-17h	Métacognition dans l'interaction virtuelle	J. Cassell
Vendredi 3 novembre Salle 26, bât 105	9h30-12h 30	1. Trouble du Spectre Autistique et neurodéveloppement : signes précoces de risque 2. Imitation et TSA	J. Nadel
salle 102 (bâtiment 105)	14h-17h	Le cerveau connecté	C. Tijus

Lundi 6 novembre salle 503 (bâtiment 105)	9h 30-12h30	Neurocybernétique du cerveau social	P. Gaussier
	14h-16h 30	Perception de l'émotion : bases neurales	J. Grèzes
Mardi 7 novembre salle 503 (bâtiment 105)	9h 30-12h 30	Théories cognitives et neuroaffectives de l'émotion	J. Nadel
	14h-16h 16h-18h	Emotion et MEG	N. George
Mercredi 8 novembre salle 503 (bâtiment 105)	9h 30- 12h30	Trouble du neurodéveloppement à l'âge adulte : approche épidémiologique	H. Vulser
	15h-16h 30 16h30-18h	La mémoire autobiographique Self, hippocampe et dysfonctionnement	P. Fossati P. Fossati
Jeudi 9 novembre salle 503 (bâtiment 105)	10h30-12h30	Mosaïque du cerveau, émotion, mémoire	G. Chapouthier
salle 102 (bâtiment 105)	14h-16h	L'émotion mimique	N. George
Vendredi 10 novembre salle 124 (bâtiment 91)	9h30-12h30	Schizophrénie et cognition sociale de l'émotion	E. Brunet
salle 124 (bâtiment 91)	14h-17h	Intelligence émotionnelle et robotique	C. Pelachaud

NCC MU5BIN12 Bases cérébrales des fonctions cognitives – Bloc 3

Lundi 27 novembre 2023

Cours de 9h30 à 12h30	Intervenant ; salle
- Introduction : Modèles cognitifs et anatomo-fonctionnels	B. Dubois ; 13.14.101
Cours de 14h à 17h00	Intervenant ; salle
- Rôle du cortex préfrontal	R. Levy ; 13.14.101

Mardi 28 novembre 2023

Cours de 9h30 à 12h30	Intervenant ; salle
- Les mécanismes cérébraux de la conscience	L. Naccache ; 13.14.101
Cours de 14h à 17h	Intervenant ; salle
- Fonction préfrontale et comportement adaptatif	E. Kœchlin ; 13.14.101

Mercredi 29 novembre 2023

Cours de 9h30 à 12h30	Intervenant ; salle
- Bases neurales de la motivation	M. Pessiglione ; 13.14.109
Cours de 14h à 17h00	Intervenant ; salle
- Méthodologies de la psychologie expérimentale	K. Ndiaye ; 13.14.109

Jeudi 30 novembre 2023

Cours de 9h30 à 12h30	Intervenant ; salle
- Neuropsychologie de l'attention spatiale	P. Bartolomeo ; 23.24.201
Cours de 14h à 17h00	Intervenant ; salle
- Bases neurales de la créativité (14h-15h30)	E. Volle ; 23.24.201
- Troubles neurologiques fonctionnels (15h30-17h)	B. Garcin ; 23.24.201

Vendredi 1 décembre 2023

Cours de 9h30 à 12h30	Intervenant ; salle
- Bases neurobiologiques de la mémoire humaine	V. La Corte ; 13.14.101
Cours de 14h à 17h00	Intervenant ; salle
- Neurocognition de la mémoire autobiographique	P. Piolino ; 13.14.101

Lundi 4 décembre 2023

Cours de 9h30 à 12h30	Intervenant ; salle
- Qu'est-ce qu'un biomarqueur ? Applications dans les domaines clinique et de la recherche (9h30-11h)	S. Bombois ; 13.14.101
- Couplages cerveau-viscères chez l'humain (11h-12h30)	C. Tallon-Baudry ; 13.14.101
Cours de 14h à 17h00	Intervenant ; salle
- Ce que les pathologies nous apprennent sur la mémoire	F. Eustache ; 13.14.101

Mardi 5 décembre 2023

Cours de 9h30 à 12h30	Intervenant ; salle
- Ganglions de la base et contrôle moteur	J. Yelnik ; 13.14.101
Cours de 14h00 à 17h00	Intervenant ; salle
- Imagerie cérébrale : principes, applications et paradigmes expérimentaux	N. Villain ; 13.14.101

Mercredi 6 décembre 2023

Cours de 9h30 à 12h30	Intervenant ; salle
- Mécanismes neurocognitifs de l'anosognosie	K. Andrade ; 24.34.307
Cours de 14h à 17h	Intervenant ; salle
- Neurosciences cognitives et société (14h00-15h30)	A. Ehrenberg ; 24.34.307
- L'Intelligence Artificielle dans les neurosciences : méthodes et limitations (15h30-17h00)	A. Pulini ; 24.34.307

Jeudi 7 décembre 2023

Cours de 9h30 à 12h30	Intervenant ; salle
- Neuropsychologie de la lecture	L. Cohen ; 23.24.201
Cours de 14h à 17h00	Intervenant ; salle
- Neuropsychologie du calcul (14h-15h30)	L. Cohen ; 23.24.201
- Cartographie et rééducation cognitive chez l'humain sain et cérébrolésé par stimulation cérébrale non invasive (15h30-17h)	A. Valero-Cabre ; 23.24.201

Vendredi 8 décembre 2023

Cours de 9h30 à 12h30	Intervenant ; salle
- Bases neurales de la perception et de la reconnaissance des visages	N. George ; 13.14.101
Cours de 14h à 16h00	Intervenant ; salle
- Modèles linguistiques, bases cérébrales et maladies du langage	M. Teichmann ; 13.14.101

Lundi 13 Novembre 2023 : Salle 505 (bât 105)

11h15-11h30 P. FOSSATI
 11h30-12h30 N HOERTEL
 14h-15h30 A. JOLIOT
 15h45-17h45 M.-O. KREBS

Introduction de l'UE
 L'utilisation des statistiques dans la recherche en psychiatrie
 Bases biologiques du développement
 Concept de vulnérabilité, modèles neuro-développementaux

Mardi 14 Novembre 2023: Salle 505 (bât 105)

14h00-15h30 R JARDRI
 15h45-17h15 A VALERO CABRE

Modèles Computationnels en psychiatrie
 Bases physiologiques et principes opérationnels de la stimulation cérébrale non invasive (TMS, tdcS) en neuropsychiatrie

Mercredi 15 Novembre 2023 : Salle 511 (bât 91)

9H30-11H00 D DAVID
 11H-13H A C PETIT
 14h-15h30 N. JAAFARI

Neurogénèse et pathologies Psychiatriques
 Ketamine et neuroinflammation
 Approche neurocognitive des troubles obsessionnels compulsifs
 Modèles animaux en psychiatrie
 Microbiote et Métabolisme du tryptophane

17H-18H H SOKOL

Jeudi 16 Novembre 2023 : Salle 514 (bât 105)

11h15-12h45 F VINCKIER
 14h00-15h30 LIANE SCHMIDT

Motivation et Pathologies Psychiatriques
 Mécanismes de l'effet placebo

Vendredi 17 Novembre 2023: Salle 511 (bât 91)

9H30-11H00 S BOURET
 11H00-12H30 P.A GEOFFROY
 14h00-15h30 A DEL CUL
 15h30-17h30 F THIBAUT

Modèles Animaux en Psychiatrie
 Sommeil et troubles de l'humeur
 Neurosciences cognitives de l'hypnose et des états méditatifs
 Génétique de la Schizophrénie

Lundi 20 Novembre 2023 : SALLE 505 (bât 105)

9h30-11h F VORSPAN
 14h00-16h00 A GUESDON
 16H00-17h30 L. HUGUEVILLE

Neurobiologie des troubles addictifs
 Mind-Wandering
 Bases physiologiques de la neuro-imagerie cognitive

Mardi 21 Novembre 2023: SALLE 112 (bât 105)

11h15-12h45 A CACHIA
 14H-15H30 S MOUCHABAC

Imagerie Cérébrale de la Schizophrénie
 Approches Dimensionnelles en psychiatrie

Mercredi 22 Novembre 2023 : SALLE 219 (bât 91)

9H-11h P FOSSATI
 14h00-16h00 H BOTTEMANNE

Imagerie cérébrale des troubles de l'humeur
 Croyance et troubles de l'humeur

Jeudi 23 novembre 2023 : SALLE 514 (bât 105)

11H-12H30 PH DOMENECH

Neuromodulation invasive en psychiatrie :TOC et dépression résistante

Vendredi 24 novembre 2023 : SALLE 511 (bât 91)

11h00-12h30 C GALERA

Vulnérabilité aux troubles anxieux et au TDAH
 Méthodes de génétique épidémiologique

Restricted enrollment Teaching Units (in English)

- MU5BIN09 Pasteur course: Development and Plasticity of the Nervous System
- MU5BIN10 ENS-Sorbonne course in Neurophysiology
- MU5BIN22 Hot topics: Transdisciplinary Approaches to neurodegenerative and Psychiatric Diseases
- MU5BIN18 Novel technologies applied to human neuropathologies
- *MU5BIN15* *Brain to Market Summer School– **description to come***

MU5BIN09 Pasteur Course: Development and Plasticity of the Nervous System – mid-September/mid-October

The course Development and plasticity of the nervous system (DPSN) covers the main cutting-edge topics of neuroscience research, at both theoretical and experimental levels. Students following the course will acquire a broad understanding of various topics ranging from molecules to behavior. Various animal models (mouse, frog and drosophila) commonly used in neuroscience research are used, giving students the opportunity to understand the difference between each model, and to further expand their repertoire of practical skills in carrying out experiments. International scientists, expert in their own field of research, provide theoretical and/or experimental courses. During the practical course, students will approach and test stem cell biology, behavioral analyses in mice, drug stereotaxic injection, neuroanatomy and gene expression analyses using histochemical techniques, which are further described below.

Evolution and Development of the Nervous System (2 weeks)

Development, Plasticity, and Pathologies of the Nervous System (2 weeks)

Prerequisites:

Knowledge of basic neurobiology.

Learning goals:

Practical information:

12 ECTS

Evaluation

Oral examination, practical course examination, and a Written examination

Hours

5 weeks, full time

Course coordinators:

Pr Alain Trembleau (alain.trembleau@sorbonne-universite.fr)

Dr Pierre-Marie Lledo (pierre-marie.lledo@pasteur.fr)

Neurons are excitable cells that "express" themselves mainly through electrical signals. These signals (membrane potential changes, current flow through ion channels ...) take place on a very fast time scale, of the order of milliseconds. The nature and speed of these signals impose strong constraints on experimental approaches for studying the physiology of neurons. The two disciplines best adapted to the requirements of Neurophysiology are electrophysiology and cellular imaging techniques.

This course aims to provide a complete theoretical and practical grounding in the electronic techniques underlying modern research in Neurophysiology. During the course, students will use existing experimental facilities at the ENS and UPMC but they will also assemble for themselves experimental setups adapted to the different planned experiments.

Methods in electrophysiology - introduction to numerical methods – Optogenetics - Linking neuronal activity to behavior - Setting up an electrophysiology rig - Analog and digital electronics for electrophysiologists - Optical path of a microscope - Patch-clamp experiments in slices - In vivo neurophysiology - Analyzing electrophysiological data

Prerequisites:

Knowledge of basic neurophysiology.

Learning goals:

- Develop experimental protocols.
- Make a synthetic presentation.
- Conduct bibliographic research.
- Critically analyze the scientific literature.
- Design a research project.
- Acquire the theoretical skills necessary to understand the concepts useful to the experimental practice of biology.
- Write experimental protocols.
- Mobilize in-depth knowledge in integrative biology.
- Design an experimental approach and then develop it in the form of a feasible project.
- Evaluate the validity and limits of the tools and methods used.
- Evaluate the validity of scientific results. Analyze and criticize experimental results.
- Master scientific and technical English in the field of the specialty

Practical information:

12 ECTS

Evaluation

- 1 written report and oral presentation (50% of the grade)
- 1 final written exam (50% of the grade)

Hours

120 hours, lectures and practical work

Course coordinators:

Pr Régis Lambert (regis.lambert@sorbonne-universite.fr)

Dr Mariano Casado (mariano.casado@bio.ens.psl.eu)

MU5BIN22 Hot Topic: Transdisciplinary Approaches to Neurodegenerative and Psychiatric Diseases

Neurodegenerative and psychiatric diseases are a major challenge for the health sector and will only become increasingly so. To tackle the complexity of these diseases, scientists need to have an interdisciplinary approach and the broadest possible points of view.

In this module, to get an appreciation for the multidisciplinary aspect of research in the field of neurodegenerative and psychiatric diseases, **students will develop a research project through analysis of scientific articles under the supervision of an expert tutor in the field, a cross between a research and bibliographic project.** Topics of the projects will cover the latest advances in neuroscience, specifically regarding neurodegenerative pathologies and/or psychiatric diseases, as well as cutting-edge technologies.

In parallel, students will be exposed to notions of fundamental, translational and clinical research by **attending conferences at the Paris Brain Institute, Neuroscience Paris Seine Institute and the Fer à Moulin Institute**, where they will participate in discussions with the international scientists presenting.

Prerequisites:

A master 1 level in biology/neurosciences or equivalent is required.

Learning goals:

- ✓ Critically analyse the scientific literature
- ✓ Master approaches and tools to study neurodegenerative and psychiatric diseases
- ✓ Evaluate the validity of these approaches and tools
- ✓ Suggest experimental approaches to answer scientific issues
- ✓ Elaborate and organise the interpretation of research data
- ✓ Present in a clear summarized manner

Practical information:

6 ECTS

Evaluation

- 1 oral presentation at the end of the first semester (80% of the mark)
- Written reports of minimum 5 conferences (20% of the mark)

Hours and commitment

Personal work throughout the first semester. At least 4 meetings with the tutor is required.

Course coordinators:

Dr. H el ene Cheval (helene.cheval@sorbonne-universite.fr)

Dr. Richard Belvindrah (richard.belvindrah@sorbonne-universite.fr)

Schedule: meetings and seminars throughout the semester- see course coordinators

MU5BIN18 Novel Technologies applied to human neuropathologies– **Bloc 1**

This course provides an overview of cutting edge methodological approaches used to study in an integrative way the molecular and cellular mechanisms associated with neuronal functions and dysfunctions. Four main technological domains will be tackled:

- 1) Omics (transcriptomics, epigenomics, proteomics)
- 2) Stem cell research (iPS cells, 2D and 3D cultures, neuronal differentiation)
- 3) Imaging (multiscale; 2D; 3D with the clearing technique, electron microscopy)
- 4) Electrophysiology (*in vivo*, *in vitro*, Multielectrode Array)

The course addresses the advances in research on **diverse brain disorders** including Parkinson's disease, ALS, Alzheimer's disease, MS, cancer, neurodevelopmental and psychiatric disorders, achieved thanks to such technologies.

The programme includes:

- Theoretical lectures describing the main techniques addressed in this course.
- Technical demonstrations at the cutting-edge technological core facilities of the Paris Brain Institute.
- Talks from expert scientists covering their latest research on neurodegenerative diseases (Parkinson's Disease, Alzheimer's Disease, ALS, MS), as well as other human pathologies (neurodevelopmental diseases, epilepsy, addiction, cancer).
- Talks from junior scientists discussing their research projects as well as their professional experience and training.
- Workshop on ethical considerations related to these new methodological approaches.

Prerequisites:

A master 1 level in neurosciences or equivalent is required. It is mandatory to follow the electrophysiology refresher lecture from Pr Stéphane Charpier in October.

Learning goals:

- ✓ Understand the most recent approaches to study cellular and molecular mechanisms underlying human diseases,
- ✓ Gain knowledge on the scientific advances in these fields,
- ✓ Acquire the methodological understanding (advantages and drawbacks of different approaches) to answer a specific scientific issue,
- ✓ Develop critical thinking about experimental design, results and literature,
- ✓ Develop analysis and synthesis skills.

Practical information:

6 ECTS

Grading:

- 1 oral presentation (analysis of a scientific article ; 30% of the mark)
- 1 written exam (70% of the mark)

Course hours: 40h lectures, round tables, demonstrations

Course coordinators:

Dr H el ene Cheval (helene.cheval@sorbonne-universite.fr)

Dr Charlotte Deleuze (charlotte.deleuze@icm-institute.org)



MU5BIN18 Novel Technologies applied to human neuropathologies– Bloc 1

	lundi 30-oct	mardi 31-oct	mercredi 01-nov	jeudi 02-nov	vendredi 03-nov	samedi 04-nov	dimanche 05-nov
9h-10h30	<i>INTRODUCTION H��l��ne Cheval, Charlotte Deleuze 10h15-10h30 room 1-2</i>	C. Deleuze + C. Dalle Multi-electrode array technology for neuroscience: Unraveling functional network activity		A. Mourot room 1-2			
10h45-12h15	P. Ravassard Omics	N. Rebola The space and time problem in neurophysiology research		B. Galet Organoids	Junior Research seminars room 1.005		
14h-15h30	D. Bohl Human induced pluripotent stem cells: a new research tool	A. Mourot Chemo- and opto-genetic tools					
15h45-17h15	<i>Pairing and choice of articles + Expectations for article analyses</i>			Neuroethics room 4	Visit R&D unit room 4 then 1.005		

	lundi 06-nov	mardi 07-nov	mercredi 08-nov	jeudi 09-nov	vendredi 10-nov
9h-10h30	N. Renier New imaging tools to study the mesoscale connectomics of the brain	I. Leroux Cellular senescence acts as a pro-tumoral mechanism during gliomagenesis	S. Betuing Deciphering cell specific transcriptomic and lipidomic regulations by modulating cholesterol metabolism in	H. Cheval LncRNAs and Parkinson's Diseases	Analyses articles JUSSIEU 24.25.108
10h45-12h15	D. Dalkara Retinal gene therapy	F. Darios Lipidomics to identify new pathological pathways in neurodegenerative diseases	Javier Zorilla De San Martin Characterization of cortical circuits in mouse models of intellectual deficiencies	JM Peyrin Reconstructing rodent and human Oriented Neuronal Networks to model Neurodegenerative syndromes	
14h-15h30	Tissue Clearing/light sheet microscopy N. Renier	G1 MEA-patch 14h-16h	G2 Ca imaging Zebrafish	Spatial transcriptomics A. Prigent, L. Stimmer	Analyses articles JUSSIEU 24.25.108
15h45-17h15		G2 MEA-patch 16h15-18h15	G1 Ca imaging Zebrafish		