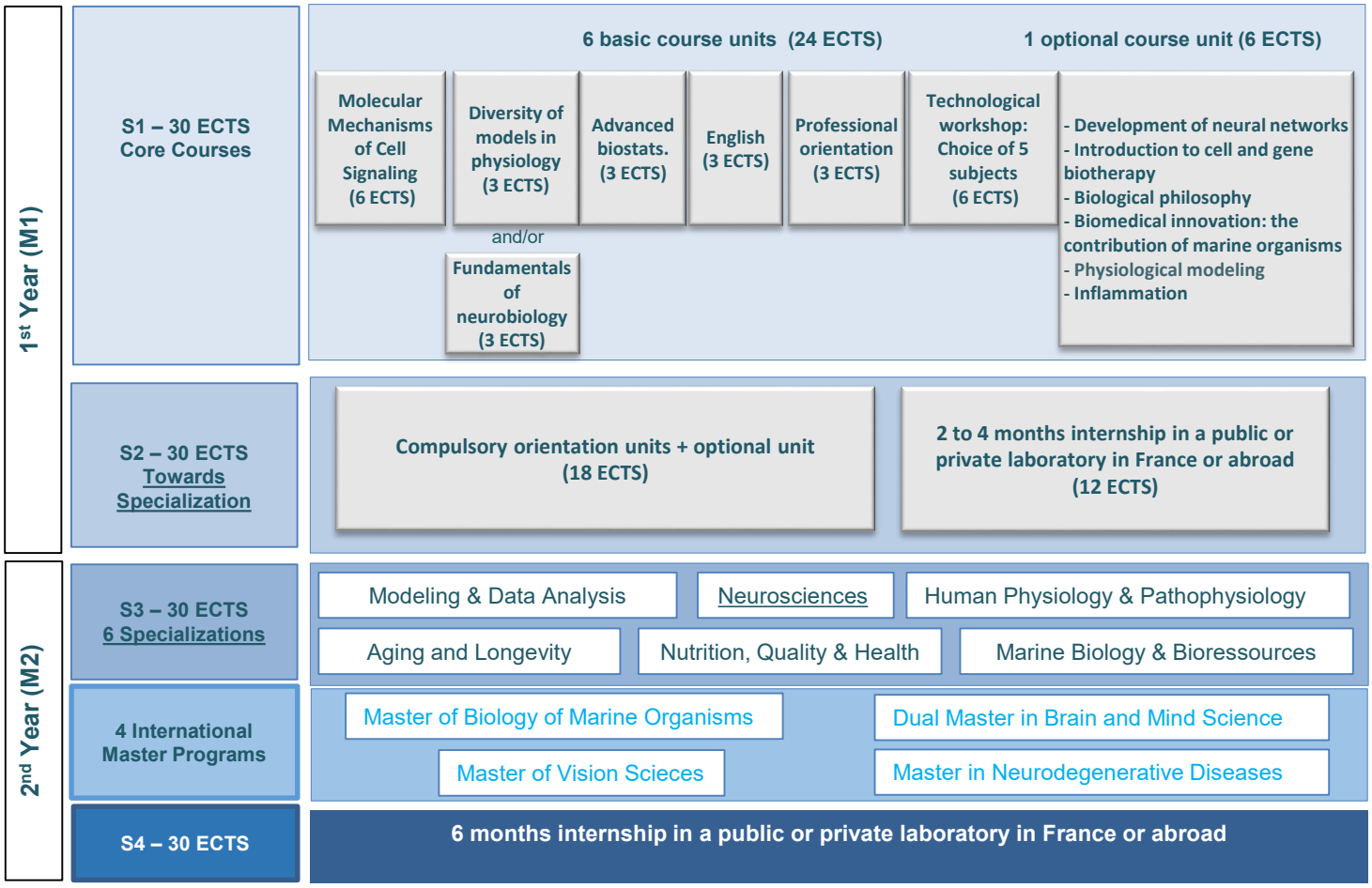
Master Integrative Biology and Physiology
Academic year 2024 - 2025

SCIENCES SORBONNE UNIVERSITÉ

bip MASTER biologie intégrative et physiologie

TABLE OF CONTENTS

Master Integrative Biology and Physiology



PRESENTATION OF THE BIP MASTER'S PROGRAM

Objectives and studies

The scientific objective of this master's course is to train students in the emerging concepts of integrative biology and physiology and to provide them with an understanding of molecular, cellular and integrated physiological and pathological mechanisms in animals and humans. Beyond this scientific knowledge, this master's course also enables students to acquire the transverse, conceptual and methodological skills required for professional integration and for the pursuit of doctoral studies.

The BIP master's program covers a broad disciplinary field, with six M2 specialties and four international programs.

The six M2 specialties:

- Aging and longevity (AL)
- Marine biology and bioresources (MBB)
- Modeling and data analysis (MDA)
- Neurosciences
- Nutrition, quality and health (NQH)
- Human physiology and pathophysiology (HPP)

The four international masters programs:

- International master in brain and mind sciences (DUAL MASTER)
- International master in biology of marine organisms (IMBMO)
- International master in neurodegenerative diseases (IMIND)
- International master of vision sciences (IMOV)

Professional insertion at the end of the Master BIP

The professional objectives of the BIP master's program favor the progressive orientation of students, guiding them towards integration into the workplace at the end of M2, or towards further doctoral studies or complementary studies to qualify in two different areas.

According to the studies 2021-2022 about professional insertion of the school year 2019:

- The principal sectors recruiting our graduates are: biotech, pharmaceutical and agrofood companies, commerce, regulatory agencies for human health and social action, specialist scientific and technical activities, service activities, local and regional government, research and teaching.
- 73% of the Master's graduates have found employment within a year following their graduation.
- Within 30 months after their graduation, 80,4% of the students were working. 35,9% were pursuing doctoral studies, 16,6% were pursuing complementary studies and 1,2% were seeking employment.
- 87% of the graduates became executives and senior managers, consistent with the objectives of the training.

Link to full studies

Admission requirements

- Students holding a bachelor's degree in life sciences, life and earth sciences or science for health form French university, foreign universities via the *Etudes en France* program, engineering school students, intern students or students from the Erasmus exchange program.
- Applications are made through an online procedure, as described on the home page of the Sorbonne University website Admission to this masters course is selective and depends on the type of bachelor's degree obtained. The examination of the application dossier may, in some cases, be followed by an interview.
- Applicants who have followed lifelong learning or APEL must contact the lifelong learning center : formation.continue@sorbonne-universite.fr

M1 YEAR: Course organization for the 1st and 2nd semesters

S1 (30 ECTS) — **6 basic course units (24 ECTS)** — **1 optional course unit (6 ECTS)**

- Molecular Mechanisms of Cell Signaling (6 ECTS)
- Diversity of models in physiology (3 ECTS) and/or Fundamentals of neurobiology (3 ECTS)
- Advanced biostats. (3 ECTS)
- English (3 ECTS)
- Professional orientation (3 ECTS)
- Technological workshop: Choice of 5 subjects (6 ECTS)

- Development of neural networks
- Introduction to cell and gene biotherapy
- Biological philosophy
- Biomedical innovation: the contribution of marine organisms
- Physiological modeling
- Inflammation

S2 (30 ECTS) : Obligatory orientation (specialty) units (12 or 18ECTS) + option (6 ECTS) + internship (12 ECTS)

- Compulsory orientation units (12 or 18 ECTS)
- 1 course unit chosen *in master BIP, BMC or SDUEE, ENVA, UBO, UBS* (6 ECTS)
- 2 to 4 months internship in a public or private laboratory in France or abroad (12 ECTS)

2nd semester M1

- **Course units choice according to educational orientation (specialty)**

Modeling and data analysis

2 compulsory course units: Python for physiological modeling, Tutored project for systems biology
1 optional unit from the following: Exploration of physiological functions in small animals, Tools for biology and applied molecular analyses, Physiology of integrated systems, Integrated neurophysiology, Inflammation

Aging and longevity

2 compulsory course units: Aging: from biology to societal issue, Brain aging
1 optional unit from the following: Exploration of physiological functions in small animals, Integrated regulation of energy balance, Python for physiological modeling, Physiology of integrated systems, Inflammation

Marine biology and bioresources

2 compulsory course units: Marine organisms and biological models, Marine genomic projects
1 optional unit from the following: Schmidt training course, "Methodologies in ecophysiology" workshop, Inflammation

Neurosciences

2 compulsory course units: Principal methodological approaches in neurosciences, Integrative neurophysiology
1 optional unit from the following: Brain aging, Python for physiological modeling, Inflammation

Nutrition, quality, health

3 units from the following: Exploration of physiological functions in small animals, Integrated regulation of energy balance, Digestive physiology, Impact of animal nutrition and conservation of agro-resources on the nutritional quality of products and human health, Python for physiological modeling, Inflammation

Human physiology and pathophysiology

1 or 2 compulsory course units : Integrated regulation of energy balance, Physiology of integrated systems, Digestive physiology
2 or *1 optional unit from the following*: Exploration of the physiological functions of small animals, Aging: from biology to societal issue, Tools for biology and applied molecular analyses, Python for physiological modeling, Inflammation

Of note: for all specialties, it is possible to take **Business passport**

Compulsory internship of 2 to 4 months in a research laboratory, in France or abroad

Students must then present their internship results as a poster, in front of a jury.

Students are encouraged to do their internship abroad in their first year; providing that their project has been approved by the international mobilty and orientation supervisors.
A financial support is granted by SU.

Secretary: Building C, 1st floor, door 105
9, quai Saint-Bernard 75252 Paris Cedex 05
University postbox 118 ✆ : 01 44 27 23 89
Laurence Bonnet-Lericque - laurence.bonnet-lericque@sorbonne-universite.fr

M2 Specialty: Modeling and data analysis

Systems biology is a priority axis of research in many international and national institutions, including Sorbonne University.

This specialty responds to the need for training in the rapidly growing domain of systems biology.

Objectives

This specialty includes physiology units, providing the student with dual skills in biology and systems biology such as computing and mathematics to be autonomous in modeling/data integration in the biomedical domain, equipping them for integration into companies and research laboratories.

The skills acquired enable the students to be immediately operational and to deal with a large range of systems biology problems.

Admission requirements

• Open to M1 students in biology from Sorbonne University or other universities, medical students, students from engineering schools, veterinary students and students from outside the European Union via Campus France.

• Selection based on application.

Secretary: Building C, 1st floor, door 105
9, quai Saint-Bernard 75252 Paris Cedex 05
University postbox : 118 ✆ : 01 44 27 47 76
Véronique De Surirey - veronique.de_surirey@sorbonne-universite.fr

Specialty Director :
Prof. Hédi Soula

Course organization

All taught courses take place in the 3rd semester.

The 4th semester is devoted to a six-month internship, either in one of the host teams (EA) from the list of laboratories supporting this specialty, or in a company. The student must then write a dissertation relating to the internship, which is defended in front of a jury. This internship can take place in France or abroad.

M2 course units	ECTS
3 compulsory course units	**15**
Advanced systems physiology	6
Statistics for data classification and mining in genomics	6
Biological networks and systems biology	3
Optional course units	**15**
Introduction to human physiology and pathophysiology 1	3
Introduction to human physiology and pathophysiology 2	3
Drug odyssey	6
Nutrigenomics	6
Vision from retina to primary visual cortex	6
Neuronal networks	6
Development of the nervous system	6
Physiologie et physiopathologie sensorielle et motrice	6
Physiological and pathological neurotransmission and signaling	6
Physiology and sensory and coordination physiopathology	6
Cellular communications	6
Physiology of perception	6
Novel technologies applied to human neuropathologies	6
Brain basis of cognitive functions	6
Hormonal brain and behaviors	6
Brain to market : Summer School	6
MEET-U	3
Genome	3

Examples of internship topics

Biomathematics
- Systems physiology
- Dynamic systems for physiology
- Modeling of nervous systems

Data science
- Analysis of medical and tissue imaging data
- Reconstruction of metabolic networks
- Biomedical machine learning

Computer simulation
- Tissue modeling
- Cell modeling

Possible careers

Study/research officer
Data scientist (medical, biomedical)
Researcher or researcher/lecturer
Development engineer (BioTech)
Head of R&D

M2 Specialty: Aging and Longevity

With the increasing life expectancy of the population, the maintenance of quality of life has become a major issue for our society. Aging is, thus, a major field encompassing crucial issues in terms of both basic science (understanding the biological processes of aging) and multiple applications (particularly in the domain of health). An understanding of these issues and the optimization of quality of life in the elderly require improvements in our comprehension of the mechanisms underlying aging and the increasing vulnerability of major physiological functions during the course of life.

Objectives

This course has two main objectives:
- First, to impart a knowledge of the physiological mechanisms, from the scale of the molecule to that of the whole body, underlying aging and longevity,
- Second, it aims to help students develop an understanding of the relationships between normal and pathological aging of the major organs and changes in the functions of these organs.

In various models and in humans, the students will analyze the physiology of the body, the genes involved in its regulation and its changes over time, as a function of environmental factors. The course will also shed light on the consequences of increasing life expectancy for public health and society.

An introduction to gerontechnologies and geriatrics will also be provided.

Admission requirements

• Open to M1 students in biology from Sorbonne University or other universities, medical, pharmacy and veterinary students, students from engineering schools and students from outside the European Union, via Campus France.

• Selection based on application.

Parcours en collaboration avec le
groupe hospitalier
La Pitié-Salpêtrière - Charles Foix

ASSISTANCE PUBLIQUE HÔPITAUX DE PARIS

Secretary: Building C, 1st floor, door 105
9, quai Saint-Bernard 75252 Paris Cedex 05
University postbox :118 ✆ : 01 44 27 47 76
Véronique De Surirey - veronique.de_surirey@sorbonne-universite.fr

Specialty Directors:
Prof. Bertrand Friguet
Prof. Rachel Sherrard

Course organization

All the taught courses will take place in the 3rd semester.

The 4th semester is dedicated to a six-month internship in a research laboratory. The student will then write a dissertation on the internship which will be defended in front of a jury. The internship may take place in France or abroad.

M2 course units	ECTS
3 compulsory course units	**24**
Mechanisms and models for studies of aging	12
Aging and regeneration of muscle tissues	6
Design and management of a research project	6
Optional course units	**6**
Science and society	6
Cancer and environment	6
Inflammatory and disabling diseases	6
Physiopathology of sensory diseases and translationnal research	6

Additional course	
Animal experimentation	6

Examples of internship topics

Endothelial dysfunction and Alzheimer's disease
Genomic changes associated with age and implicated in tumor initiation
Changes to the secretome of human myoblasts induced by replicative senescence
Molecular basis of age-related memory loss
Can rTMS prevent age-related cognitive decline?
Detection *in vivo*, by MRI, of Alzheimer's disease lesions in a primate model
Effects of acute stress on the immune system in the elderly.
Gerontechnology and accessibility

Possible careers

Study/research officer
Executive or senior manager in bioindustries or in the cosmetic or pharmaceutical industry
Academic/bioindustry researcher or researcher-lecturer (master's + PhD)
Clinical research assistant
Technical and commercial executive
Scientific communication

M2 Specialty: Marine Biology and Bioresources

The term “marine biotechnologies” encompasses both studies and the use of marine bioresources (microorganisms, macroalgae and metazoans), together with the use of biotechnological and industrial tools arising from marine biology. This high-level specialty aims to train the scientific leaders of tomorrow in the domain of marine biology and biotechnology.

Objectives

- To provide students with fundamental and applied training in the integrative biology of marine organisms,
- To train scientific managers in biology and marine biotechnology.

Admission requirements

• Open to M1 students in biology from Sorbonne University or other universities who have taken options in cell or molecular biology, organism biology, or chemistry/biology and students from outside the European Union, via Campus France.

• Selection based on application.

Program infrastructures

- The Pierre et Marie Curie Campus,
- The three marine stations of Sorbonne University (the biological station at Roscoff and the oceanological observatories at Villefranche-sur-Mer and Banyuls-sur-Mer),
- The partner universities in Brittany (West Brittany University and South Brittany University).

The professionalization option relies on support from employers in the Brittany region, including companies with sea-related activities.

CNRS UPMC INSU
Station Biologique
Roscoff

Secretary: Building C, 1st floor, door 105
9, quai Saint-Bernard 75252 Paris Cedex 05
University postbox 118 ✆ : 01 44 27 47 76
Véronique De Surirey - veronique.de_surirey@sorbonne-universite.fr

Specialty Directors:
Karen Pottin
Stéphanie Bertrand

Course organization

All the taught courses take place in the 3rd semester.

The 4th semester is devoted to a six-month internship in a research laboratory or company, depending on the student's professional plans. At the end of the internship, the student must write a dissertation, which is defended in front of a jury. The internship may take place in France or abroad.

M2 course units	ECTS
3 compulsory course units	**18**
Marine models in development and evolution	6
Biotechnology of the macromolecules of marine organisms	6
Biotechnology of marine algae	6
Optional course units	**12**
Biotests and bioresources in the marine environment	6
Translational regulation	6
Biofilms	6
Lights, rhythm and control of bio activities	6
Adaptation in the marine environment	6

Examples of internship topics

Integrative biology of marine organisms.
- Omics: from genes to the organism in its environment.
- Evolutionary scenarios for the molecular mechanisms governing cellular life or the development of organisms.
- Genome evolution.
- Valorization of marine resources.
- Innovations in the biomedical and biotechnological domains originating from marine organisms.

Possible careers

Study/research officer
Quality assurance manager
Academic/industrial researcher or lecturer-researcher (master's + PhD)
R&D manager
Commercial representative

M2 specialty: Neurosciences

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
- psychiatric diseases
- neurodegenerative diseases
- vision
- …

Objectives

This specialty aims to offer broad, high-quality training in neurosciences. Five thematic tracks are proposed so each student to build his own personal curriculum:

- Cellular and integrative neuroscience
- Cognitive and behavioral neuroscience
- Vision science
- Neurodegenerative diseases
- Neurobiology of psychiatric diseases

Admission requirements

• Open to M1 biology students from Sorbonne University or other universities, medical students (interns, medicine and science, INSERM school), students from engineering schools and *grandes écoles*, students from outside the European Union, via Campus France.

• Selection based on application.

Program infrastructures

- Institute Neuroscience Paris Seine,
- Hospital of La Pitié Salpêtrière,
- Institute du Cerveau et de la Moëlle Epinière,
- Institute de la Vision,
- Institute du Fer à Moulin,
- Institute Pasteur,
- Ecole Normale Supérieur (ENS)

Secretary: Building B, 1st floor, door 105
9, quai Saint-Bernard 75252 Paris Cedex 05
University postbox 118 ✆ : 01 44 27 23 88
Geoffrey Dobigny - geoffrey.dobigny@sorbonne-universite.fr

Specialty Director:
Prof. Ann Lohof

Course organization

All the taught courses take place in the 3rd semester.

The 4th semester is dedicated to a six-month internship in a research laboratory. At the end of this internship, the student must write a dissertation that is defended in front of a jury. The internship may take place in France or abroad.

M2 course units	ECTS
1 compulsory course unit	**6**
Design of a research project	6
Optional course units	**18**
Pasteur Course *	12
ENS – SU of neurophysiology *	12
Brain to market summer school *	6
Development of the nervous system	6
Neuronal networks: information processing and representation	6
Cellular communication	6
Sensory and motor physiology and pathophysiology	6
Glial and neurodegenerative diseases	6
Physiological and pathological neurotransmission and signaling	6
Vision: from retina to primary visual cortex	6
Physiology of perception	6
Physiopathology of sensory diseases and translational research	6
Novel technologies applied to human neuropathologies	6
Understanding psychiatric disorders : from signaling molecules to circuit & behavior	6
The social brain and emotions	6
Neurobiology and psychiatric diseases	6
Cerebral basis of cognitive functions	6
Hot topics : transdiciplinary approaches to neurodegenerative and psychiatric diseases	6

Additional course	
Animal Experimentation	6

*: Selective course units

Exploratory course units (2x3 ECTS)
2 modules must be chosen from the following list common to every thematic tracks

Hormonal brain and behavior
Molecular neuropharmacology
Neuron-glia interactions
Memory and spatial navigation
Hippocampus: from cells to physiology and human disease
Brain imaging
Cerebellum
Neural basis of olfactory perception
Pharmacological approaches in neuroscience
Neuropsychiatry genetics
Thalamocortical rhythms
Modeling in biophysical and computational neuroscience
Animal models in behavioral neurosciences
New Methods for Behavioral & Cognitive Explorations: Applications to Neurodegenerative Diseases

Examples of internship topics

Genetics and pathophysiology of familial epilepsy
Processing of sensory information and neurovascular imaging
Role of axon guidance molecules
Cellular interactions in neurodegenerative diseases
Development of neural networks

Possible careers

Study/research officer
Academic/industrial researcher or lecturer-research (master's + PhD)
Technical manager in neurosciences
Clinical research associate at a clinical investigation center or in the private sector

M2 specialty: Nutrition Quality and Health

We approach **human nutrition from fundamental and public health standpoints**.
The increasing frequency of diseases linked to nutrition, such as obesity and diabetes, and the complications associated with them, must be seen in relation to changes in eating habits. Indeed, in developed countries, we are seeing not only a marked increase in calorie intake, but also a dangerous drift in terms of the quality of the foods ingested. In addition, problems of undernutrition are observed in developing countries, but also in certain deprived populations and the elderly in Western countries. In this context, access to high-quality food has become a major societal demand. Recent sanitary crises have revealed that fears (which may or may not be justified) remain concerning the origin and quality of foods.

In this master's specialty, we propose training in the domains of **food hygiene, quality and safety, nutrition/health communication, and research and development** in the domain of nutrition. The **relationships between diet and human health are at the heart of this training**.

Objectives

Professionalization in nutrition field with courses on demand in 3 theoretical and practical domains:

- food quality and safety for health,
- R&D, nutritional development and innovation,
- nutritional communication and education.

Admission requirements

- Open to M1 students in biology from Sorbonne University or other universities, medical and veterinary students, students from engineering schools and students from outside the European Union, through Campus France.
- Selection based on application and interview.

Nutrition, Quality and Health
it is also
an Alumni network

Secretary: Building C, 1st floor, door 105
9, quai Saint-Bernard 75252 Paris Cedex 05
University postbox : 118 ✆ : 01 44 27 72 86
Carole Harduin - carole.harduin@sorbonne-universite.fr

Specialty Directors:
Prof. Khadija El Hadri
Dr. Véronique Béréziat

Course organization

All the taught courses take place in the 3rd semester.

The 4th semester is dedicated to a six-month internship in a research laboratory. At the end of this internship, the student must write a dissertation that is defended in front of a jury. The internship may take place in France or abroad.

M2 course units	ECTS
2 compulsory units	**12**
Scientific and technical project	6
Business knowledge	6
Optional course units	**18**
Food and health	6
The hygiene component of quality and risk management	6
Initiation in bioengineering	6
Innovation and communication	6
Quality management in a company (UE from the QUESS masters)	6
Nutrigenomics	6
Introductory unit PPH1 (choice of 1 course unit from the following list: cardiovascular diseases or hepatic pathophysiology)	3
Introductory unit PPH2 (choice of 1 course unit from the following list: renal pathophysiology, pulmonary pathophysiology, metabolic pathophysiology)	3
Science and society (course unit from the specialty Human physiology and pathophysiology)	6

Examples of internship topics

Organization of nutrition trade fairs
Scientific advice and support – nutritional audits
Product control during and after production
Ensuring the setting up and/or application of sanitary management plans
Performance of sanitary audits
Updating of food hygiene control procedures
Contribution to the obtainment of ISO certification
Product development
Development of sanitary accreditation dossiers
Development of accreditation requests for tools in accordance with national health and nutrition plans
Scouting, commercial strategy and marketing in nutrition

Possible careers

Project manager in health education
Scientific assistant in a communication agency
Controller in the domains of competition, consumption and fraud prevention
Project leader in nutritional communication
Product manager
Food hygiene, quality and safety manager
Project manager (communication, innovation, new products)
R&D manager in industry
Health Safety and Quality Manager (Health, Safety, Quality and Environment) in IAA
Regulatory affairs manager

M2 specialty: Human Physiology and Pathophysiology

In this specialty, we learn about the major functions required to maintain metabolism and homeostasis of the internal environment. The students address the molecular and cellular origin of a large range of organ-specific and multi-system diseases through studies of the mammalian body, focusing on humans in particular. Current and future therapies in development for these diseases will also be presented.

The engineering platform option (PPH-PI) provides an understanding of both human physiology and pathophysiology, and the technologies used to study these fields. PPH teaching is reinforced by practical training on various technology platforms at SU institutes and research centers, covering aspects linked to technological design, programming and data analysis.

Objectives

This specialty aims to provide students with a precise vision of modern physiology and the pathophysiological mechanisms leading to disease.
It will enable the students to perform biomedical research and access the jobs akin.
Within the 2nd semester, students will look into the main functions of the human body. While within the second year, they will apprehend the physical, cellular or biochemical origins of pathophysiology to identify the ongoing and under development therapeutic means.

Admission requirements

• Open to M1 students in biology from Sorbonne University or other universities, medical, pharmacy and veterinary students, students from engineering schools, students from outside the European Union via Campus France.

• Selection based on application.

Secretary: Building C, 1st floor, door 105
9 quai Saint-Bernard 75252 Paris Cedex 05
University postbox : 118 ✆ : 01 44 27 47 76
Véronique De Surirey - veronique.de_surirey@sorbonne-universite.fr

Specialty Director:
Prof. Philippe Le Rouzic

Course organization

All the taught courses take place in the 3rd semester.

The 4th semester is dedicated to a six-month internship in a research laboratory. At the end of the internship, the student must write a dissertation that is defended in front of a jury. The internship may take place in France or abroad.

M2 course units	ECTS
3 compulsory course units	**12**
Design of a scientific project	6
Introductory unit PPH1: choice from the following units: cardiovascular diseases or hepatic pathophysiology	3
Introductory unit PPH2: choice from the following units: renal pathophysiology, lung diseases, metabolic pathophysiology	3
Optional course units	**18**
Cancer and environment	6
Drug Odyssey	6
Endocrinology: from cell to organism	6
Initiation in bio engineering	6
Inflammatory diseases: from pathophysiology to new treatments	6
Nutrigenomics	6
Science and Society	6
Physiopathology of sensory diseases and translationnal research	6

Additional course	
Animale experimentation	6

Examples of internship topics

Inflammation and joint diseases linked to aging
Genetics of hereditary diseases
Cell signaling and cardiac remodeling
The mineralocorticoid receptor: pathophysiology and therapeutic innovations

Possible careers

Clinical research assistant
Academic/industrial research or researcher-lecturer (master's + PhD)
Biomedical engineer
Study/research officer
Technical/commercial assistant

iMIND: international Master in Neurodegenerative Diseases

Understanding the functions and pathologies of the human brain is one of the greatest scientific challenges of our time. Brain disorders represent a burden to society and the associated costs more than one third of the cost of illness in Europe. It is essential to push back the limits of our knowledge on brain diseases, including neurodegenerative pathologies affecting more specifically the elderly.

The International Master in Neurodegenerative Diseases (iMIND) is a multidisciplinary program built on the partnership between the master BIP Neuroscience major, and the Paris Brain Institute (https://institutducerveau-icm.org/en/).

The Paris Brain Institute will offer upon selection up to 4 scholarships for international students. (600€/month during the 1st semester)

Objectives

It aims to train students who wish to understand the brain function in normal and pathological conditions, by providing access to the latest knowledge on neurodegenerative diseases, in close proximity with the research community (scientific teams, senior and junior researchers, technical platforms, living labs…).

Admission requirements

• Open to M1 students in biology from Sorbonne University or other universities, medical, pharmacy and veterinary students, students from engineering schools, students from outside the European Union via Campus France.

• Selection based on application.

UNIVERSITÄT HEIDELBERG ZUKUNFT SEIT 1386

Trinity College Dublin The University of Dublin

Paris Brain Institute ICM

KU LEUVEN

TUM

SORBONNE UNIVERSITÉ

Secretary: Building C, 1st floor, door 105
9, quai Saint-Bernard 75252 Paris Cedex 05
University postbox 118 ✆ : 01 44 27 47 76
Véronique De Surirey - veronique.de_surirey@sorbonne-universite.fr

Specialty Director:
Dr. Hélène Cheval

Course organization

All courses take place in the 3rd semester.

The 4th semester is devoted to the Master's thesis, a 6-month internship in a research laboratory. Students defend their thesis in front of a jury at the end of the semester. The internship is carried out in France or in a laboratory affiliated to iMIND's partner universities: University of Heidelberg, Trinity College Dublin, KU Leuven, and the Technical University of Munich.

M2 course units	ECTS
4 compulsory course units	**24**
Developing a Research Project	6
Novel technologies applied to human neuropathologies	6
Hot topics : transdiciplinary approaches to neurodegenerative and psychiatric diseases	6
Glial pathologies and neurodegenerative diseases	6
Optional course units	**6**
Brain to market summer school	6
1 specialization module from each series (2 x 3 ECTS)	**6**
Series 1: • New Methods for Behavioral and Cognitive Explorations • Hippocampus : from cells to physiology and human pathology	3
Series 2: • Neuron-glia interactions • Neuro-psychiatry genetics	3

Examples of internship topics

Characterization of a 3D human cellular model of Parkinson's disease using organoids and assembloids
Neuronal mechanisms for epileptic seizures in humans
Modulation of microglia-node of Ranvier interaction by neuronal activity in health and demyelinating diseases
Involvement of cortico-subthalamic projections in postoperative gait disorders in neurostimulated Parkinson's disease patients.
Deregulation of cholesterol metabolism in Huntington's disease
Functional consequences of Idh1 and Cic mutations on oligodendroglioma cells of origin in mouse models

Possible careers

Design / research engineer
Researcher in academia or industry (Master + PhD)
Associate professor (Master + PhD)
Clinical research associate in CIC or in the private sector

International Master in Brain and Mind Sciences (Dual Master)

The neurosciences and cognitive sciences span a vast range of scientific topics, from cellular and molecular neurobiology to human cognition. A broad understanding of these different fields is an essential component for understanding the complex functions of the nervous system in normal and pathological situations. This 2-year program aims to train Masters students through coursework and research internships, preparing them to undertake doctoral research.

Objectives

The Dual Master in Brain and Mind Sciences is a two-year Masters program in partnership between the master BIP Neuroscience major, the Ecole Normale Supérieure, and University College London (https://www.ucl.ac.uk/prospective-students/graduate/taught-degrees/brain-and-mind-sciences-msc).

The Dual Masters aims to provide an individualized program of study to each student, allowing for the exploration of multidisciplinary perspectives. Students may choose to emphasize cellular, molecular, systems, or cognitive neurosciences, and are encouraged to follow courses in several different neuroscience disciplines.

Students in the Dual Masters program benefit from high-quality teaching and research opportunities, during Year 1 at UCL, and during Year 2 in Paris at Sorbonne Université and the ENS. Students undertake two distinct research internships, one in each year, providing them with considerable laboratory experience, allowing them to gain knowledge of multiple methods of investigation into the nervous system.

Admission requirements

- Candidates for the Dual Masters should have a Licence/BSc in Life Sciences or another discipline closely-related to the Brain and Mind Sciences such as Cognitive Science or Psychology. Applicants are selected on the basis of academic excellence, motivation, and academic recommendations.
- Competence in English is required for admission by UCL; Year 2 in Paris can be done in French or in English

UCL

SORBONNE UNIVERSITÉ

1794 ENS ÉCOLE NORMALE SUPÉRIEURE

Secretary: Building C, 1st floor, door 105
9, quai Saint-Bernard 75252 Paris Cedex 05
Case Courrier 118 ✆ : 01 44 27 23 88
Geoffrey Dobigny – geoffrey.dobigny@sorbonne-universite.fr

Specialty directors:
Pr. Ann Lohof
Dr Andréa Dumoulin (ENS)

Course organization

Year 1: Brain and Mind Sciences MSc at UCL: https://www.ucl.ac.uk/prospective-students/graduate/taught-degrees/brain-and-mind-sciences-msc
Coursework and laboratory research project; Masters thesis and MSc diploma from UCL.

Year 2: Dual Masters in Brain and Mind Sciences track, Master2 BIP Neurosciences major.
Coursework chosen from 1) Master2 BIP Neurosciences major, 2) ENS Biology department, and/or ENS Master of Cognitive Sciences.
6-month laboratory research project; M2 thesis and oral defense; Master diploma from Sorbonne Université

Year 1, University College London	credits
Credits for the year (2 credits = 1 ECTS)	**180**
Thematic coursework in Neurosciences and Cognitive Sciences	90
Library Project	30
Research project and thesis	60

Year 2, Sorbonne Université and ENS	ECTS
Semester 1, coursework	**30**
Developing a Research Project	6
4 courses from a list of approx 25 approved courses (Sorbonne, ENS Biology, Cogmaster)	24
Semester 2 M2 research project and thesis	**30**

Examples of internship topics

The influence of isoforms of amyloid-β on microglial cells in different transgenic mouse models for Alzheimer's disease
Crosstalk between glial cells and neurons at the nodes of Ranvier
Investigating the mitochondrial stress responsein neuronal models of Parkinson's disease
Cortical dynamics of function learning strategies in multidimensional environments
Selective Attention as a Double Edged Sword in Multidimensional Environments
A rodent model for studying the hippocampus-amygdala dialogue in PTSD

Possible careers

Design / research engineer
Researcher in academia or industry (Master + PhD)
Associate professor (Master + PhD)
Clinical research associate in CIC or in the private sector

IMOV : International master of Vision Sciences

Vision is the sense whose loss has the greatest impact on daily life. However, with the aging of the world population and other aggravating factors, the number of people affected by blindness or severe visual impairment will have doubled by 2050, with over 500 million people in the world.
The Vision Institute, with Sorbonne University and the Autonomous University of Mexico (UNAM) have launched an innovative educational course dedicated to Vision Sciences to train those who will meet tomorrow's health challenges related to vision.

Objectives

As part of the Neurosciences course, the Vision Sciences program presents the trans-disciplinarity of the study of the visual system.

Students will discover:

- The organization of the visual system, from the eye to the visual cortex, through the techniques that allow its exploration (photonics, optogenetics, models, genomics, connectomics)
- Visual perception and its porous boundaries with other integrated functions (psychophysics, visual attention, “multi-sensorial” integration, vision and space).
- How can the therapeutic transfer of fundamental methods take place ? The physiopathology of sensory diseases and methods of visual rehabilitation and restoration.

Admission requirements

• Open to M1 students in biology from Sorbonne University or other universities, medical students, engineering students, pharmacists and veterinarians, students outside the European community via Campus France.

• Selection based on application.

INSTITUT DE LA VISION

UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO

Secretary: Building C, 1st floor, door 105
9 quai Saint-Bernard 75252 Paris Cedex 05
Case Courrier 118 : 01 44 27 23 88
Geoffrey Dobigny – geoffrey.dobigny@sorbonne-universite.fr

Specialty director:
Gregory Gauvain

Course organization

All lessons take place in the 3rd semester, in English.

The 4th semester is devoted to a 6-month internship in a research laboratory or in a company. The internship gives rise to the writing of a thesis with defense in front of a jury. The internship can be carried out in France or abroad.
The program offers opportunities for financial support for the modality towards our partners (UNAM, Tubingen Institute for ophthalmic research)

M2 course units	ECTS
4 compulsory course units	**24**
Design of a research project	6
Vision from retina to primary visual cortex	6
Neurophysiology of perception	6
Physiopathology of sensory diseases and translational research	6

Optional course units	6
Hormonal brain and behaviors	3
Molecular Neuropharmacology	3
Neuron-glia interactions	3
Memory and spatial navigation	3
Hippocampus : from cells to physiology and human pathology	3
Imaging of the visual cortex	3
Cerebellum	3
Neural basis of olfactory perception	3
Pharmacological approaches in neuroscience	3
Neuro-psychiatry genetics	3
Thalamo-cortical rhythms	3
Computational in neuroscience	3
Animal models in behavioral neurosciences	3
New Methods for Behavioral & Cognitive Explorations: Applications to Neurodegenerative Diseases	3

Examples of internship topîcs

Electrophysiological characterization of graphene implant for visual restoration
Effect of mutant LRIT3, implicated in congenital night blindness, on rodent behavior
Study by light sheet microscopy of the decussation of the retino-thalamic projections
Optogenetic stimulation of pluripotent stem cells in-vitro

Possible careers

Clinical research associate
Academic/industry researcher or
Associate Professor (Master + doctorate)
Biomedical engineer
Study/research engineer
Technical sales engineer

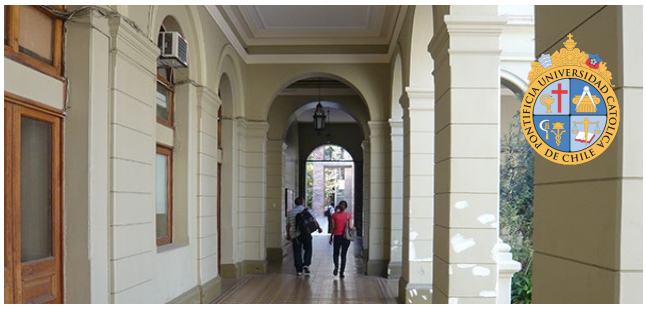
The vision institute is an important partner of the IbioNext incubator, where many start-ups are in development.

International Master Program
Biology of Marine Organisms: fundamental and applied bases

Not open in 2024-2025

Sorbonne University is offering an international master program within the Master of Integrative Biology and Physiology in collaboration with the Pontifical Catholic University of Santiago (PUC, Chile). A portion of the coursework in marine biology, will take place at two of the SU marine stations: in Banyuls-sur-mer (on the Mediterranean Sea) and in Roscoff (on the English Channel).

Sorbonne University



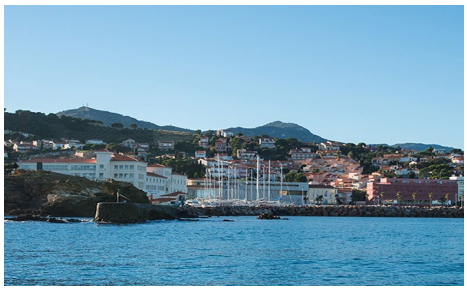
Pontifical Catholic University of Santiago

Objectives

This program addresses both fundamental and applied aspects of the integrative biology of marine organisms, offering valuable practical knowledge and experience to students interested in careers in fundamental research as well as in applied fields (biotechnology, aquaculture...).

Admission requirements

Participants in this international master program will be selected from each partner university, and will benefit from additional financial support.



Oceanological Observatory of Banyuls-sur-mer

Coastal Marine Research station of the PUC

Roscoff Marine Station

Secretary: Building C, 1st floor, door 105
9, quai Saint-Bernard 75252 Paris Cedex 05
Case Courrier 118 ✆ : 01 44 27 47 76
Véronique De Surirey – veronique.de_surirey@sorbonne-universite.fr

Specialty director :
Laurence Besseau

Course organization

M1 - SU Paris from September to December
M1 - PUC Chile: research internship: January - February
M1 - PUC Santiago: from March to June

M2 - SU OOB Banyuls: from end September to November
M2 - SU Roscoff marine station: November - December

M1 course units	ECTS
2 compulsory course units	**12**
M1 Research internship, PUC, Chile	12
M1 courses from PUC	
• Marine models and their applications	12
• Introduction to aquaculture	6
• Research seminars	6
M2 courses from SU	
In Banyuls	
• Biorhythms	6
• Marine Biotests and Bioresources	6
• Marine models in development and evolution	6
In Roscoff	
• Biotechnology of marine algae	6
• Biotechnology of marine molecules	6
• Adaptation of respiration and osmo-regulation in the marine environment	6

Examples of internship topics in Chile

Physiology of marine organisms (algae, animals)
Aquaculture (diet, animal welfare)
Marine microbiology
Marine biotechnologies

Principal partners

Higher education institutions

- **National level**
- Alfort National Veterinary School
- La Pitié Salpêtrière - Charles Foix Hospital Group
- South Brittany University
- The Ecole Normale Supérieure – ULM
- The Pasteur Institute
- The Brain & Spine Institute (ICM)

- **International level**
- The National Autonomic University of Mexico (Mexico City, Mexico)
- Miguel Hernandez de Echa University (Alicante Spain)
- The Pontifical Catholic University of Chile (Santiago, Chile)
- University College London (United Kingdom)
- Catholic University of Leuven (Belgium)
- University of Vienna (Austria)
- Trinity College Dublin (Irlande)
- Technical University of Munich (TUM)
- Københavns Universitet (Danemark) : **4EU+**
- Università degli Studi di Milano (Italie) : **4EU+**
- Ruprecht-Karls-Universität Heidelberg (Allemagne) : **4EU+**
- Univerzita Karlova (République Tchèque) : **4EU+**
- Uniwersytet Warszawski (Pologne) : **4EU+**

- **Laboratories and PhD schools**
- Sorbonne University institutions
- The Brain & Spine Institute (ICM)
- Institute of Complex Systems
- The Vision Institute
- Institute of Cardiometabolism and Nutrition
- Intelligent Systems and Robotics Institutes
- Biology Institute Paris Seine

- **Institutions outside Sorbonne University**
- ENS, ENVA, Collège de France, the Pasteur Institute, ESPCI, INRA, IRD, IBPC

- **PhD schools**
- Brain, cognition, behavior (ED 158)
- Physiology, pathophysiology and therapeutics (ED 394)
- Complexity of living organisms (ED 515)

Sorbonne University marine stations

- Roscoff biological station
- Oceanological observatory at Villefranche-sur-Mer
- Oceanological observatory at Banyuls-sur-Mer

Companies

- Activ International
- Agence Protéines
- Alma Consulting Group
- Cabinet Vidon
- Daco France
- Danone
- Innovation SAS
- Lesieur
- Orly Distribution
- Ozymes
- Proméga
- Sup'Biotech Paris
- Universal Medica,

….

Pedagogical services

TEACHING TEAM

Director
Prof. Isabelle Limon
Isabelle.limon@sorbonne-universite.fr

Assistant Director
Prof. Hédi Soula
hedi.soula@sorbonne-universite.fr

Study Director
Prof. Sonia Karabina
sonia.karabina@sorbonne-universite.fr

Head of International Mobility
Dr. Gaël Orieux
gael.orieux@sorbonne-universite.fr
Dr. Eric Schwartz
eric.schwartz@sorbonne-universite.fr

Head of Professional Integration
Dr. Aurore L'Honoré
aurore.lhonore@sorbonne-universite.fr

Head of Evaluation
Prof. Pierre Joanne
pierre.joanne@sorbonne-universite.fr

Directors of the International Master's Programs (PIM)

Biology of Marine Organisms
Prof. Laurence Besseau
laurence.besseau@sorbonne-universite.fr

Dual Master's Program in Brain and Mind Science
Prof. Ann Lohof
ann.lohof@sorbonne-universite.fr
Dr Andréa Dumoulin (ENS)
andrea.dumoulin@bio.ens.psl.eu

International Master in Neurodegenerative Diseases (iMIND)
Dr. Hélène Cheval
helene.cheval@sorbonne-universite.fr

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

Heads of the M2 Specialties

Modeling and data analysis
Prof. Hédi Soula
hedi.soula@sorbonne-universite.fr

Aging and Longevity
Prof. Bertrand Friguet
bertrand.friguet@sorbonne-universite.fr
Prof. Rachel Sherrard
rachel.sherrard@sorbonne-universite.fr

Marine Biology and Bioresources
Dr. Karen Pottin
karen.pottin@sorbonne-universite.fr
Dr. Stephanie Bertrand
stephanie.bertrand@sorbonne-universite.fr

Neurosciences
Prof. Ann Lohof
ann.lohof@sorbonne-universite.fr

Nutrition, Quality and Health
Dr. Véronique Béréziat
veronique.bereziat@sorbonne-universite.fr
Prof. Khadija El Hadri Zegouagh
khadija.zegouagh@sorbonne-universite.fr

Human Physiology and Pathophysiology
Prof. Philippe Le Rouzic
philippe.le_rouzic@sorbonne-universite.fr

Secretarial services

Administrative manager

Marine Catrice
marine.catrice@sorbonne-universite.fr

Administrative and educational manager for M1

Laurence Bonnet Lericque
laurence.bonnet-lericque@sorbonne-universite.fr

Administrative and educational managers for M2

Elodie Kovacic
elodie.kovacic@sorbonne-universite.fr

Véronique De Surirey
veronique.de_surirey@sorbonne-universite.fr

Carole Harduin
Carole.harduin@sorbonne-universite.fr

Modeling and data analysis
sciences-master-bip-bs@sorbonne-universite.fr

Aging and longevity
sciences-master-bip-bvl@sorbonne-universite.fr

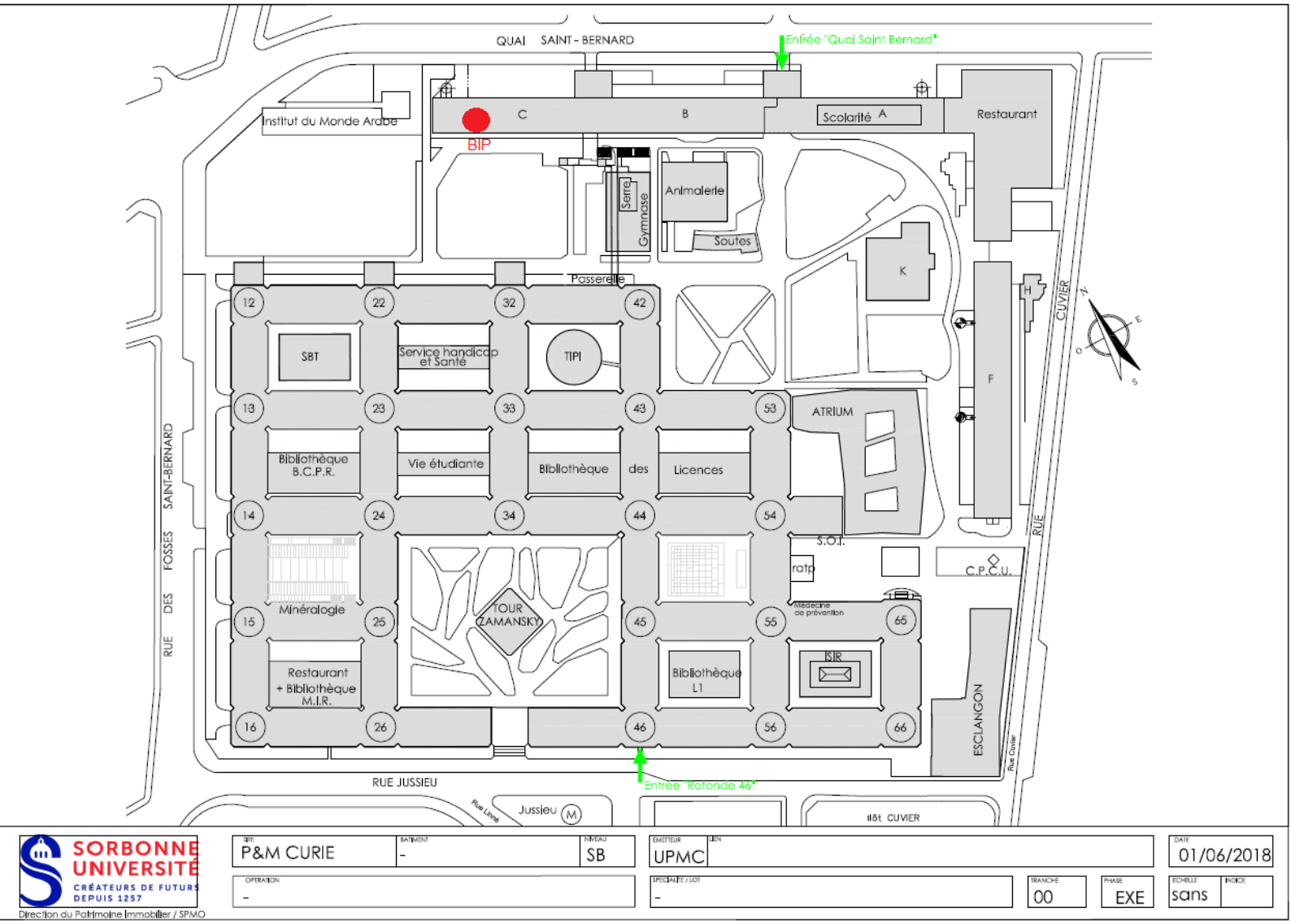
Marine biology and bioresources
sciences-master-bip-bbma@sorbonne-universite.fr

Human physiology and pathophysiology
sciences-master-bip-pmph@sorbonne-universite.fr

Neurosciences
sciences-master-bip-neurosciences@sorbonne-universite.fr

Nutrition, quality and health
sciences-master-bip-nutrition@sorbonne-universite.fr

Useful information



Address

Campus Pierre et Marie Curie
Bâtiment C, 1er étage, porte 105
9, quai Saint Bernard - Case courrier 118
75252 Paris Cedex 05

Marine Biology
Medical systems biology
Neurobiology
Functional biology of organisms
Metabolism
Health and safety
Obesity and diabetes
Relationship between diet and health
Molecular biology
Human aging
Longevity
Electrophoresis
Electrophysiology
Drugs
Genetic variability
Pathophysiology
Inflammation
Marine biology
Medical systems biology
Neurobiology
Functional biology of organisms
Metabolism
Health and safety
Pathological behavior
Relationship between diet and health
Molecular biology
Humain aging
Longevity
Electrophoresis
Medical systems biology
Electrophysiology
Normal and pathological behaviors
Systems
Drugs
Genetic variability
Functional biology of organisms
Physiopathology
Inflammation
Marine biology
Neurobiology
Longevity
Metabolism
Biologie marine
Neurobiology
Functional biology of organisms
Metabolism
Health and safety
Obesity and diabetes
Medical systems biology
Relationship between diet and health
Molecular biology
Physiopathology
Inflammation
Pathological behavior
Obesity and diabetes
Relationship between diet and health

BIP Website

MASTER
biologie intégrative et physiologie