Academic year 2020 – 2021
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- Marine biology and bioresources
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- Human physiology and pathophysiology
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www.master.bip.sorbonne-universite.fr
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 five international programs.

The six M2 specialties:

- Systems biology (SB)
- Ageing and longevity (AL)
- Marine biology and bioresources (MBB)
- Neurosciences
- Nutrition, quality and health (NQH)
- Human physiology and pathophysiology (HPP)

The four international masters programs:

- Biology of marine organisms, in partnership with the University of Santiago in Chile, as part of the MBB specialty (currently being restructured)
- Dual master in brain and mind science, in partnership with the ENS and UCL, as part of the Neurosciences specia
- International master in neurodegenerative diseases, in partnership with Trinity College Dublin, the University of Vienna, KU Leuven and the Technical University of Munich (TUM), as part of the Neurosciences specialty
- Vision sciences, in partnership with the UNAM, as part of the Neurosciences specialty

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.

- This master’s course has existed since 2004, providing us with 10 years of data concerning the careers and posts held by the recipients of this diploma, revealing numerous professional possibilities.
- 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.
- 98% of the 2014/2015 BIP master’s graduates have found employment, according to a ministerial survey of master’s students 30 months after their graduation performed by the BVA polling agency, with a response rate of 46%. These figures have remained relatively stable from year to year, indicating the effective integration of our graduates into the workplace.
- The rate of access to a first job is 98%, with a median duration of one month to obtaining this first job. After 20 months, 46% of the students were pursuing doctoral studies, 45% were working (permanent, short-term and other contracts), 5% were pursuing complementary studies and 4% were seeking employment.
- 80% of the graduates became executives and senior managers, consistent with the objectives of the training. Finally, 70% agreed that their employment corresponded to the content of their training. The careers of the graduates were highly diverse, although almost all were covered by the “study, research and development” and “cultural, health, social, sport” BVA categories. This adaptability of the diplomas obtained appears to be chosen and not imposed, because 94% of those questioned were entirely or rather satisfied with the missions conferred on them.

Conditions of admission

- 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 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 www.master.bip.sorbonne-universite.fr. 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.
M1 YEAR: Course organization for the 1st and 2nd semesters

1st semester of M1

<table>
<thead>
<tr>
<th>S1 – 30 ECTS:</th>
<th>6 basic course units (24 ECTS) and 1 optional course unit (6 ECTS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diversity of models in physiology (3 ECTS)</td>
<td>Advanced biostats. (3 ECTS)</td>
</tr>
<tr>
<td>or fundamentals of neurobiology (3 ECTS)</td>
<td>English in science (3 ECTS)</td>
</tr>
<tr>
<td></td>
<td>Professional orientation (3 ECTS)</td>
</tr>
<tr>
<td></td>
<td>Technological workshop: Choice of 5 subjects (6 ECTS)</td>
</tr>
<tr>
<td></td>
<td>Development of neural networks</td>
</tr>
<tr>
<td></td>
<td>- Inflammation</td>
</tr>
<tr>
<td></td>
<td>- Introduction to cell and gene biotherapy</td>
</tr>
<tr>
<td></td>
<td>- Biological philosophy</td>
</tr>
<tr>
<td></td>
<td>- Biomedical innovation: the contribution of marine organisms</td>
</tr>
<tr>
<td></td>
<td>- Systems physiology</td>
</tr>
</tbody>
</table>

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

Obligatory orientation units (12 or 18 ECTS)

1 course unit chosen in master BIP, BMC or SDUEE, ENVA, UBO, UBS (6 ECTS)

Two- to four-month internship in a public or private laboratory in France or abroad (12 ECTS)

2nd semester M1

- Choice of course units according to educational orientation (specialty)

**Systems biology:** 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.

**Ageing and longevity:** Ageing: from biology to societal issue – Brain ageing, 1 optional unit from the following: Physiology of integrated systems, Exploration of physiological functions in small animals, Integrated regulation of energy balance, Python for physiological modeling.

**Marine biology and bioresources:** “Marine organisms and biological models” workshop, “Marine genomic projects” workshop, 1 optional unit from the following: Schmid training course, “Methodologies in ecophysiology” workshop.

**Neurosciences:** Principal methodological approaches in neurosciences, Integrative neurophysiology, 1 optional unit from the following: Brain aging, Python for physiological modeling.

**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.

**Human physiology and pathophysiology:** 3 units from the following: Exploration of the physiological functions of small animals, Aging: from biology to societal issue, Digestive physiology, Tools for biology and applied molecular analyses, Physiology of integrated systems, Integrated regulation of energy balance, Python for physiological modeling.

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

- **Obligatory internship**

The placement takes place in a research laboratory in France or abroad (2 to 4 months). The student must then present their internship results as a poster, in front of a jury.
M2 Specialty: Systems Biology

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.

Objective of the training

This specialty consists of a series of specific course units enabling students to develop skills and knowledge in computing (programming, development, simulation) and mathematics (modeling, formalism, prediction) applied to contexts in integrative biology and physiology.

This specialty also includes physiology units, providing the student with dual skills in biology and systems biology. This specialty trains students 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.

Conditions for admission

• 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 by dossier and an interview.
**Course organization**

All taught courses take place in the third trimester.

The fourth 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 (subject to validation by the directors of the specialty and the head of Mobility).

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### M2 course units

<table>
<thead>
<tr>
<th>Course Units</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 obligatory course units 15 ECTS</td>
<td></td>
</tr>
<tr>
<td>Advanced systems physiology</td>
<td>6</td>
</tr>
<tr>
<td>Statistics for data classification and mining in genomics</td>
<td>6</td>
</tr>
<tr>
<td>Biological networks and systems biology</td>
<td>3</td>
</tr>
<tr>
<td>4 optional course units (from the list below) 15 ECTS</td>
<td></td>
</tr>
<tr>
<td>Introduction to human physiology and pathophysiology 1 (unit from the Human physiology and pathophysiology specialty)</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to human physiology and pathophysiology 2 (unit from the Human physiology and pathophysiology specialty)</td>
<td>3</td>
</tr>
<tr>
<td>Neuronal networks (unit from the Neurosciences specialty)</td>
<td>6</td>
</tr>
<tr>
<td>Nutrigenomics (unit from the Human physiology and pathophysiology specialty)</td>
<td>6</td>
</tr>
<tr>
<td>Vision: from the retina to the primary visual cortex (unit from the Neurosciences specialty)</td>
<td>6</td>
</tr>
<tr>
<td>Brain To Market* (unit from the Neurosciences specialty)</td>
<td>6</td>
</tr>
</tbody>
</table>

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### Examples of topics for internship projects

**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

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### Possible careers after M2 BIP speciality

**Systems biology**
- Study/research officer
- Data scientist (medical, biomedical)
- Researcher or researcher/lecturer
- Development engineer (BioTech)
- Head of R&D
M2 specialty: Ageing and Longevity

With the increasing life expectancy of the population, the maintenance of quality of life has become a major issue for our society. Ageing 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 of the training

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 ageing and longevity.

Second, it aims to help students develop an understanding of the relationships between normal and pathological ageing 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.

Conditions of admission

- 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 by dossier

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

ASSISTANCE PUBLIQUE HÔPITAUX DE PARIS

Secretary: Building B, 3rd floor, door 314
9, quai Saint-Bernard 75252 Paris Cedex 05

University postbox :118 ☎ : 01 44 27 23 88
sciences-master-bip-bvl@sorbonne-universite.fr

Specialty Directors:
Prof. Bertrand Friguet and Prof. Rachel Sherrard
Course organization

All the taught courses will take place in the third semester.

The fourth 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 (subject to validation by the course directors and the Head of Mobility).

Examples of topics for internship projects

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 after the BIP M2 specialty

Ageing and longevity

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 course units

<table>
<thead>
<tr>
<th>Course Unit</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 compulsory course units</td>
<td>24 ECTS</td>
</tr>
<tr>
<td>Mechanisms and models for studies of aging</td>
<td>12</td>
</tr>
<tr>
<td>Ageing and regeneration of muscle tissues</td>
<td>6</td>
</tr>
<tr>
<td>Design and management of a research project</td>
<td>6</td>
</tr>
<tr>
<td>1 optional course unit from another specialty</td>
<td>6 ECTS</td>
</tr>
<tr>
<td>Science and society (course unit from the Human physiology and pathophysiology specialty)</td>
<td>6</td>
</tr>
<tr>
<td>Cancer and environment (course unit from the Human physiology and pathophysiology specialty)</td>
<td>6</td>
</tr>
<tr>
<td>Inflammatory and disabling diseases (course unit from the Human physiology and pathophysiology specialty)</td>
<td>6</td>
</tr>
<tr>
<td>Eye diseases (course unit from the Human physiology and pathophysiology specialty)</td>
<td>6</td>
</tr>
<tr>
<td>Additional course</td>
<td></td>
</tr>
<tr>
<td>Animal experimentation</td>
<td>6</td>
</tr>
</tbody>
</table>
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, to meet the challenges of research and innovation.

Objective of the training

This specialty aims to provide students with fundamental and applied training in the integrative biology of marine organisms. It accords considerable importance to research, the learning of concepts and the development of methods and techniques widely used in laboratories.

This specialty also includes a specific professionalization option in the domain of marine biotechnologies.

Training is dispensed at multiple sites: the Pierre and 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) and 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.

Conditions for admission

• 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 by dossier.

International master’s program:

Biology of marine organisms
In partnership with the Pontifica Universidad Catolica de Chile (Santiago, Chile)

Directors: Laurence Besseau & Yves Desdevises
laurence.besseau@sorbonne-universite.fr
yves.desdevises@sorbonne-universite.fr

Additional Spanish courses (not included in the educational contract) are available for students going to study in Spanish-speaking countries as part of their international masters program.

Contact: the language department
Marie-Laure Refort marie-laure.refort@sorbonne-universite.fr

Secretary: Building B, 3rd floor, door 314
9, quai Saint-Bernard 75252 Paris Cedex 05
University postbox 118 ☎ : 01 44 27 23 88
sciences-master-bip-bbma@sorbonne-universite.fr

Specialty Directors:
Prof. Eric Quéinnec and Prof. Patrick Cormier
Course organization

All the taught courses take place in the third semester.

The fourth 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 (subject to validation by the course directors and the Head of Mobility).

### M2 course units

<table>
<thead>
<tr>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>18 obligatory ECTS</strong></td>
</tr>
<tr>
<td>Marine models in development and evolution</td>
</tr>
<tr>
<td>Biotechnology of the macromolecules of marine organisms</td>
</tr>
<tr>
<td>Biotechnology of marine algae</td>
</tr>
<tr>
<td><strong>12 exploratory ECTS from the following</strong></td>
</tr>
<tr>
<td>Biotests and bioresources in the marine environment</td>
</tr>
<tr>
<td>Translational regulation (course unit common to the BMC masters)</td>
</tr>
<tr>
<td>Creating a start-up company</td>
</tr>
<tr>
<td>Biofilms</td>
</tr>
<tr>
<td>Biorythms</td>
</tr>
<tr>
<td>Biology and adaptation in extreme environments</td>
</tr>
<tr>
<td>Adaptation in the marine environment</td>
</tr>
</tbody>
</table>

### Examples of topics for internship projects

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 after the BIP M2 specialty Marine biology and bioresources

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

Thanks to their teaching infrastructures and accommodation and their immediate proximity to the sea, the marine stations of Sorbonne University at Roscoff, Villefranche-sur-Mer and Banyuls-sur-Mer provide a perfect framework for these studies and ideal working conditions. The partnership established with the Brittany region and the Breton partner universities provides students with access to the employment market linked to the sea.
The Master BIP-Neuroscience program trains students in all fields of neuroscience:

- cellular and molecular neuroscience
- integrated neuroscience
- cognitive neuroscience
- systems and computational neuroscience
- cellular and integrative neuroscience
- cognitive and behavioral neuroscience
- vision science
- neurodegenerative diseases
- neurobiology of psychiatric diseases

Objective of the training

This specialty aims to offer broad, high-quality training in neurosciences. To help students organizing their formation, 5 thematic tracks are proposed but courses from different thematic can be selected by each student to build his own personal curriculum:

- cellular and integrative neuroscience
  ann.lohof@sorbonne-universite.fr
- cognitive and behavioral neuroscience
  philippe.fossati@aphp.fr
- vision science
  gregory.gauvain@sorbonne-universite.fr
- neurodegenerative diseases
  helene.cheval@sorbonne-universite.fr
- neurobiology of psychiatric diseases
  peter.vanhoutte@sorbonne-universite.fr
  sandrine.betuing@sorbonne-universite.fr

Our training program is based on:

- more than 30 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, Institut du Cerveau et de la Moelle épinière, Institut de la Vision, Institut du Fer à Moulin), and with the Institut Pasteur and the École Normale Supérieure (ENS)
- 3 international training programs in partnership with University College London, University of Vienna, Technical University of Munich, KU Leuven, National Autonomous University of Mexico, and Trinity College Dublin
- 10 months of internship in internationally-recognized laboratories in France or abroad

Conditions for admission

The Neurosciences are fundamentally interdisciplinary, and our program is aimed at students from many different backgrounds

- 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.
- Admission upon application online; dossiers evaluated by the Neurosciences education team

International master’s programs:

**Dual master’s program in brain and mind science**
In partnership with University College London
Director: Ann Lohof : ann.lohof@sorbonne-universite.fr

**Vision Sciences**
In partnership with Universidad Nacional Autónoma de México - UNAM
Director: Grégory Gauvain
gregory.gauvain@sorbonne-universite.fr

**International master in neurodegenerative diseases (iMIND)**
In partnership with the University of Vienna, Trinity College Dublin, KU Leuven and the Technical University of Munich (TUM).
Director: Hélène Cheval helene.cheval@sorbonne-universite.fr
### General organisation

<table>
<thead>
<tr>
<th>Course Unit</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design of a research project</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Core course units

Total of 18 ECTS to be selected from the following list according to the chosen thematic track:

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

### Exploratory course units (2x3 ECTS)

2 modules must be chosen from the following list common to every thematic track:

- 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

### Examples of topics for internship projects

- 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 after the BIP M2 specialty Neurosciences

- 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.

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

- Project management, data management & analysis
- Scientific writing, presentation skills, entrepreneurship
- Developing scientific expertise, critical reading of the scientific literature, creativity …

### Additional course

<table>
<thead>
<tr>
<th>Course</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimentation animale</td>
<td>6</td>
</tr>
</tbody>
</table>
M2 specialty: Nutrition Quality and Health

In this specialty, 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.

### Objective of the training

The objective of this specialty is to provide students with the skills required to evaluate future strategic, economic, industrial and societal issues relating to nutrition.

The students are sensitized to the impact of nutrition on health, through molecular, cellular and integrated aspects of nutrition research.

This specialty facilitates the professionalization of students in the theoretical and practical domains of food quality and safety for health, nutritional communication, health/nutrition communication or nutritional innovation and R&D, with support from companies (more than 80 companies, institutions and start-ups). In this way, the students acquire the knowledge and skills required for:

- Analyses of relationships between food, quality and health, the preventive role of diet, an understanding of the pathophysiological mechanisms underlying nutritional diseases
- Evaluation and expert advice, regulatory issues, analyses of dietary dangers and risks and their management
- Project management, teamwork, nutritional innovation and written and oral communication, in French and English.

### Conditions for admission

- 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 by dossier and interview

Parcours en partenariat avec l’École Nationale Vétérinaire d’Alfort (ENVA)
Course organization

All the taught courses take place in the third semester.

The fourth semester is dedicated to a six-month internship in a company. 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 (subject to validation by the directors of the specialty and the Head of Mobility).

<table>
<thead>
<tr>
<th>M2 course units</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2 obligatory units 12 ECTS</strong></td>
<td></td>
</tr>
<tr>
<td>Scientific and technical project</td>
<td>6</td>
</tr>
<tr>
<td>Business knowledge</td>
<td>6</td>
</tr>
<tr>
<td><strong>3 units from the list below, 18 ECTS</strong></td>
<td></td>
</tr>
<tr>
<td>Food and health</td>
<td>6</td>
</tr>
<tr>
<td>The hygiene component of quality and risk management</td>
<td>6</td>
</tr>
<tr>
<td>Initiation in bioengineering</td>
<td>6</td>
</tr>
<tr>
<td>Innovation and communication</td>
<td>6</td>
</tr>
<tr>
<td>Quality management in a company (UE from the QUESS masters)</td>
<td>6</td>
</tr>
<tr>
<td>Nutrigenomics (course unit from the specialty Human physiology and pathophysiology)</td>
<td>6</td>
</tr>
<tr>
<td>Introductory unit PPH1: choice of a course unit from the following list: cardiovascular diseases or hepatic pathophysiology</td>
<td>3</td>
</tr>
<tr>
<td>Introductory unit PPH2: choice of a course unit from the following list: renal pathophysiology, pulmonary pathophysiology, metabolic pathophysiology</td>
<td>3</td>
</tr>
<tr>
<td>Science and society (course unit from the specialty Human physiology and pathophysiology)</td>
<td>6</td>
</tr>
</tbody>
</table>

Examples of topics for internship projects
- 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 after the BIP MP specialty Nutrition, quality and health
- 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

Nutrition, Quality and Health is also a network of former students:

https://nutribip.wordpress.com
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.

Objective of the training

This specialty aims to provide students with a precise vision of modern animal physiology and the pathophysiological mechanisms leading to disease.

At the end of this training, the students will have the skills required:

• To perform research in the domain of pathophysiology, to elucidate the physical, cellular or biochemical mechanisms leading to the appearance of a disease and its consequences.

• To analyze the biological signs of a disease, to perform experiments and to identify the mechanisms by which a possible treatment could re-establish the normal functioning of the affected organ or tissue.

• To develop and organize theoretical interpretations of experiments and analyses, to communicate and valorize the results in the form of scientific publications and oral presentations in French and/or English.

Conditions for admission

• 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 by dossier.
Course organization

All the taught courses take place in the third semester.

The fourth semester is dedicated to a six-month internship in a research laboratory or company, according to the option chosen by the student. 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 (subject to validation by the directors of the specialty and the Head of Mobility).

<table>
<thead>
<tr>
<th>M2 course units</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2 compulsory course units (12 ECTS)</strong></td>
<td></td>
</tr>
<tr>
<td>Design of a scientific project</td>
<td>6</td>
</tr>
<tr>
<td>Introductory unit PPH1: choice from the following units: cardiovascular diseases or hepatic pathophysiology</td>
<td>3</td>
</tr>
<tr>
<td>Introductory unit PPH2: choice from the following units: renal pathophysiology, lung diseases, metabolic pathophysiology</td>
<td>3</td>
</tr>
<tr>
<td><strong>3 units from the following list (18 ECTS)</strong></td>
<td></td>
</tr>
<tr>
<td>Cancer and environment</td>
<td>6</td>
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<tr>
<td>Drug Odyssey</td>
<td>6</td>
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<tr>
<td>Endocrinology: from cell to organism</td>
<td>6</td>
</tr>
<tr>
<td>Initiation in bioengineering</td>
<td>6</td>
</tr>
<tr>
<td>Inflammatory diseases: from pathophysiology to new treatments</td>
<td>6</td>
</tr>
<tr>
<td>Nutrigenomics</td>
<td>6</td>
</tr>
<tr>
<td>Science and Society</td>
<td>6</td>
</tr>
<tr>
<td>Eyes diseases</td>
<td>6</td>
</tr>
<tr>
<td><strong>Additional course</strong></td>
<td></td>
</tr>
<tr>
<td>Animal experimentation</td>
<td>6</td>
</tr>
</tbody>
</table>

Examples of topics for internship projects

- 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 after BIP M2 Human physiology and pathophysiology

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

Address
Campus Pierre et Marie Curie
Building B, 3rd floor, door 314
9, quai Saint Bernard – University postbox 118
75252 Paris Cedex 05

Open to the public
Monday to Friday, from 8.45 a.m. to 5:30 p.m.
Principal partners

Higher education establishments

• **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 (Ireland)
  - Technical University of Munich (TUM)
  - Københavns Universitet (Denmark) : 4EU+
  - Università degli Studi di Milano (Italy) : 4EU+
  - Ruprecht-Karls-Universität Heidelberg (Germany) : 4EU+
  - Univerzita Karlova (Czech Republic) : 4EU+
  - Uniwersytet Warszawski (Poland) : 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
- ...

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