

## Master in Molecular and Cellular Biology Cell Biology, Development and Stem Cell Track

### M2 Developmental Biology

#### Introduction

The aim of this program is to provide students with conceptual and methodological expertise in the field of developmental biology. Developmental biology is at the crossroads of several disciplines such as cell biology, genetics and molecular biology. Understanding the fundamental mechanisms of development processes can thus be approached using these different approaches. Developmental biology also contributes to the understanding of carcinogenesis and genetic developmental diseases and paves the way for studies of therapeutic approaches.

#### Formation

The "Developmental Biology" theme includes a specialization teaching (30 ECTS), theoretical and practical, and a long internship (30 ECTS) in the laboratories associated with the course, located in France or abroad. This program is carried out in partnership with the "Institut Curie" and entirely taught in English.

The 30 ECTS of teaching corresponding to the first semester of M2 allow students to be trained in the mastery of concepts and methods. This period includes four teaching units:

- Specialization Unit "Developmental biology course" Institut Curie - SU in collaboration with the Institut Curie (MU5BM211, 12 ECTS, chairperson Clémence Carron-Homo).  
This teaching unit is an intensive theoretical and practical course which aims to study all the concepts, problems and technologies of modern developmental biology. The program extends from the control of gene expression and cellular interactions to the construction of an organized multicellular embryo. Students receive theoretical and experimental instruction on normal and pathological aspects of development. They are confronted with different embryonic models, including genetic models.

(Drosophila, C. elegans, mouse, zebrafish) and classical experimental embryology (xenopus, chicken), using the latest methodologies and technologies. Lectures are given by internationally renowned researchers on topics ranging from cell specification and differentiation, stem cells, morphogenesis and organogenesis to intracellular signaling and the control of gene expression during development. Practical approaches are developed to reinforce the concepts described in the lectures and allow students to discuss freely with the speakers. The program lasts five weeks comprising three weeks of practical workshop and two weeks of lectures (limited to 18 students).

The organization of these courses is taken care of by a teaching team which ensures the follow-up and the evaluation of the students.

- **Scientific analysis** (MU5BM051, 6 ECTS)

The objective is to acquire a method for analyzing experimental data, to be able to interpret these data and to place them in their scientific context. The student will present orally in English a major and recent article relating to developmental biology. The fifteen-minute presentation will be followed by ten minutes of discussion with the members of the jury.

- **Scientific project** (MU5BM091, 6 ECTS)

This teaching unit is dedicated to the presentation of the research project that the student will develop during his laboratory internship. The jury will assess the student's ability to initiate a project, to develop relevant scientific questions and to propose the appropriate experiments to answer these questions. The project presented must correspond to a research program carried out by a person for a duration equivalent to a thesis.

- **Open Unit** devoted to the study of the development of marine organisms (MU5BM200, 6 ECTS, chairperson Carine Barreau) strongly recommended

The objective of this course is to illustrate the variety and the conservation of the fundamental mechanisms of development by studying the embryos of several marine animals belonging to different phyla. Emphasis is placed, on the one hand, on fertilization and early events as well as, on the other hand, on the implementation of the organizational plan. Using classic embryology methods and current molecular and cellular biology techniques, students will carry out classic and original experiments to characterize and analyze certain aspects of these fundamental mechanisms. The teaching takes place at the Villefranche-sur-Mer marine biology station (SU/CNRS) and is provided by the station's researchers

- Other opening UEs can be selected depending on the organization: UE Transreg at the Roscoff Station, MU5BM232, 6ECTs, chairperson Patrick Cormier or even Curie courses (to be discussed with the pedagogical team if necessary)

- UE de **stage en laboratoire** (MU5BMSO3, 30 ECTS)

Laboratory internship (MU5BMSO3, 30 ECTS)

This internship takes place in a host team under the direction of an internship supervisor and in consultation with the teaching team. The list of host teams and internship proposals for M2 students are posted on the Moodle platform accessible only to students registered with the BMC mention. The student may possibly carry out his internship in a laboratory not appearing on this list, subject to the agreement of the teaching team. The internship lasts six months outside the periods occupied by the courses described above.

### **Audience**

The program is open for students enrolled in science, medicine, as well as for students from the Grandes Ecoles who have followed an M1 course in biology integrating developmental biology lessons as well as to any student with a solid initial training in a related discipline (engineering sciences, physics, chemistry, ...) and having a strong motivation for life sciences.

### **Opportunities**

This course is designed to train high-level specialists in the field of developmental biology. It thus offers students the possibility of working in academic or into other professions such as scientific development or consulting.

### **Scientific committee**

C. Carron-Homo (IBPS, SU), E. Hirsinger (IBPS, SU), M. Cohen-Tannoudji (Institut Pasteur), Samuel Tozer (ENS), Muriel Umbhauer (IBPS, SU) et J. Matthieu (Collège de France)

### **Application**

Applications are processed through the dedicate website of Sorbonne Université:

### **Contacts :**

#### **Chairperson**

Clémence Carron-Homo

[clemence.carron\\_homo@sorbonne-universite.fr](mailto:clemence.carron_homo@sorbonne-universite.fr)

#### **Secretariat**

Annie-Laure Bernard

[annie-laure.bernard@sorbonne-universite.fr](mailto:annie-laure.bernard@sorbonne-universite.fr)

For more information +

Molecular and Cellular Biology Web site

<https://sciences.sorbonne-universite.fr/formation-sciences/offre-de-formation/masters/master-biologie-moleculaire-et-cellulaire-bmc>