Undergraduate program "Frontiers in Life Science"

University Paris Descartes
Centre de Recherche Interdisciplinaire
Fondation Bettencourt-Schueller

International Semester
January-June 2014

The undergraduate program "Frontiers in Life Science" ("Frontières du Vivant" - FdV) was created in 2011 as an undergraduate program of excellence in interdisciplinary life science, based on innovative pedagogical methods and learning through research.
The "Frontiers in Life Science" program received the MCE Awards for "innovative pedagogy" in 2013 and is supported by the UNESCO "Learning through Research" chair and by the Fondation Bettencourt-Schueller.

The International Semester at "Frontiers in Life Science" program offers a unique opportunity to 20 international students to study in an interdisciplinary research-oriented environment in Paris, France. This semester is made for students highly motivated by science, who wish to develop and improve their scientific skills and better understand the world of research before starting a Master program. The applicants should have completed two years of undergraduate studies in formal or natural sciences and provide us a detailed account of relevant curricular and extracurricular activities. The application must therefore include a CV, a letter of motivation and academic records, including a proof of enrolment in your university of origin for the year 2013/2014. Recommendation letters and additional documents are welcome, but not mandatory.

Learning through research and for research

The undergraduate FdV program offers a rare opportunity to explore the functioning, the challenges and the complexity of the research world. Our specially designed courses lead the students towards the understanding of scientific research, the sociology and methodology of science. The skills and knowledge acquired through the courses are deepened even further through internships in research labs or

through student research projects conducted in our undergraduate research lab. Our teaching team's goal is to develop research competencies in each student. In addition to our research-based courses, all undergraduate students benefit from numerous international conferences and workshops and close contact with interdisciplinary life science Master and PhD students affiliated to the Centre for Research and Interdisciplinarity (CRI).

Our ambition is to foster the development of the next generation of innovative and autonomous leaders, capable of collaborative work, efficient communication and critical thinking. We believe these skills are essential for future challenges in scientific fields, as well as in any field requiring problem-solving skills, creativity and responsibility.

An integrated interdisciplinary program

The International Semester consists of carefully designed and highly integrated modules using evolution of life on Earth as the foundation for interdisciplinary exploration of biological systems. Interdisciplinarity in life sciences is explored at the interfaces between biology, physics and chemistry; biology, mathematics and computer science; biology and medicine. Scientific methodology is an integral part of training: our students examine the diversity of scientific methodologies and ethical responsibility in science, practice experimental design and analysis of research articles, and develop project management, writing and presentation skills. These concepts don't stay theoretical; they are introduced and reinforced through group discussions, hands-on activities and research projects.

A community of learners

To maximize the fruitful interactions and emergence of novel interdisciplinary ideas, undergraduate program "Frontiers in Life Science" (FdV) welcomes students from diverse scientific backgrounds. Even though the majority of our students have shown prior interest in life science, we encourage students with backgrounds in computer science, mathematics, physics and chemistry to contribute to this exceptional learning experience. The mixing of students from various backgrounds is essential in creating a learning environment where each student can contribute with their own speciality, tutor those who need help in that field, as well as receive help from other students coming from another field. Such a community of learners/tutors emerges spontaneously in the beginning of the semester, during a special welcome and integration week, and continues to develop during the semester. We foster learning interactions through teamwork and peer-to-peer evaluations, as one of the hallmarks of modern science-related work.
Students participating in the International Semester will be in close interactions with other undergraduate students in FdV program, as well as Master and PhD students, through student-organized clubs, research projects and conferences.

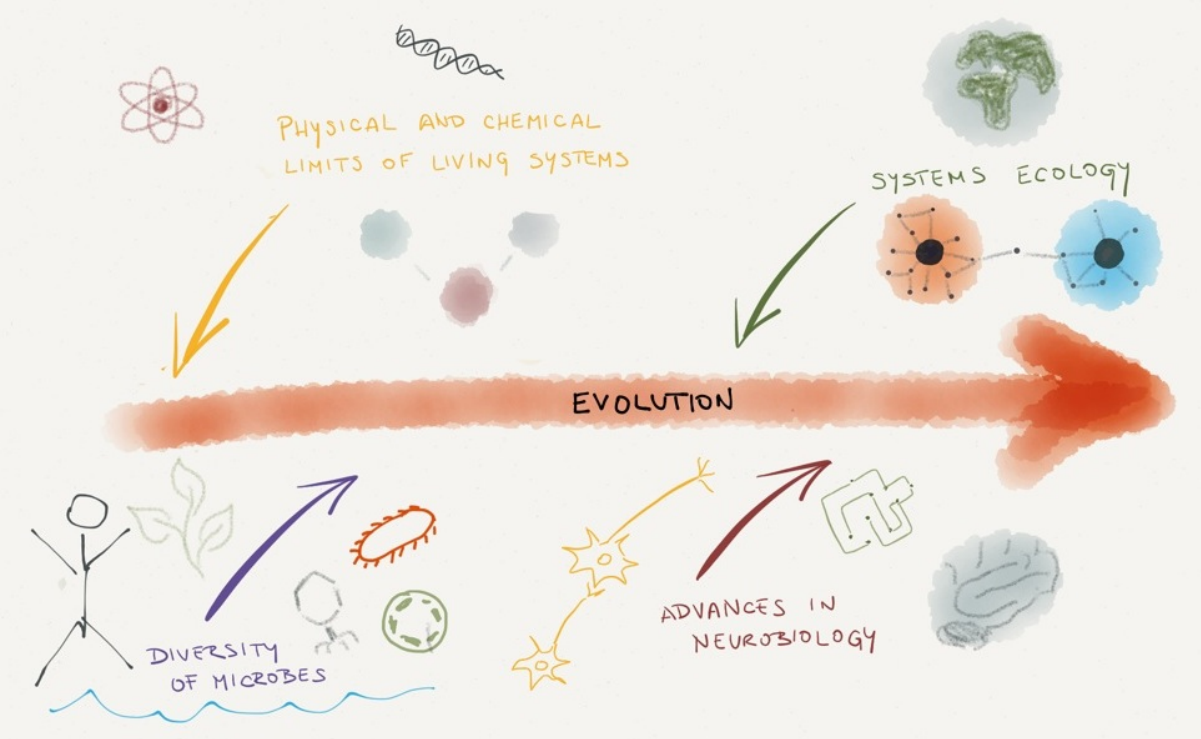
International Semester curriculum, spring 2014

Semester begins on January 13th and ends on June 1st 2014

The International Semester starts with a welcome and integration week during which the students get to know each other and other students in FdV programs, as well as the interdisciplinary environment at the Centre for Research and Interdisciplinarity.

The International Semester modules are taught in English and carry 30 ECTS points (300h of teaching, with an estimated workload for a full semester of approximately 600-900h). We employ multifaceted continuous evaluation in all modules.

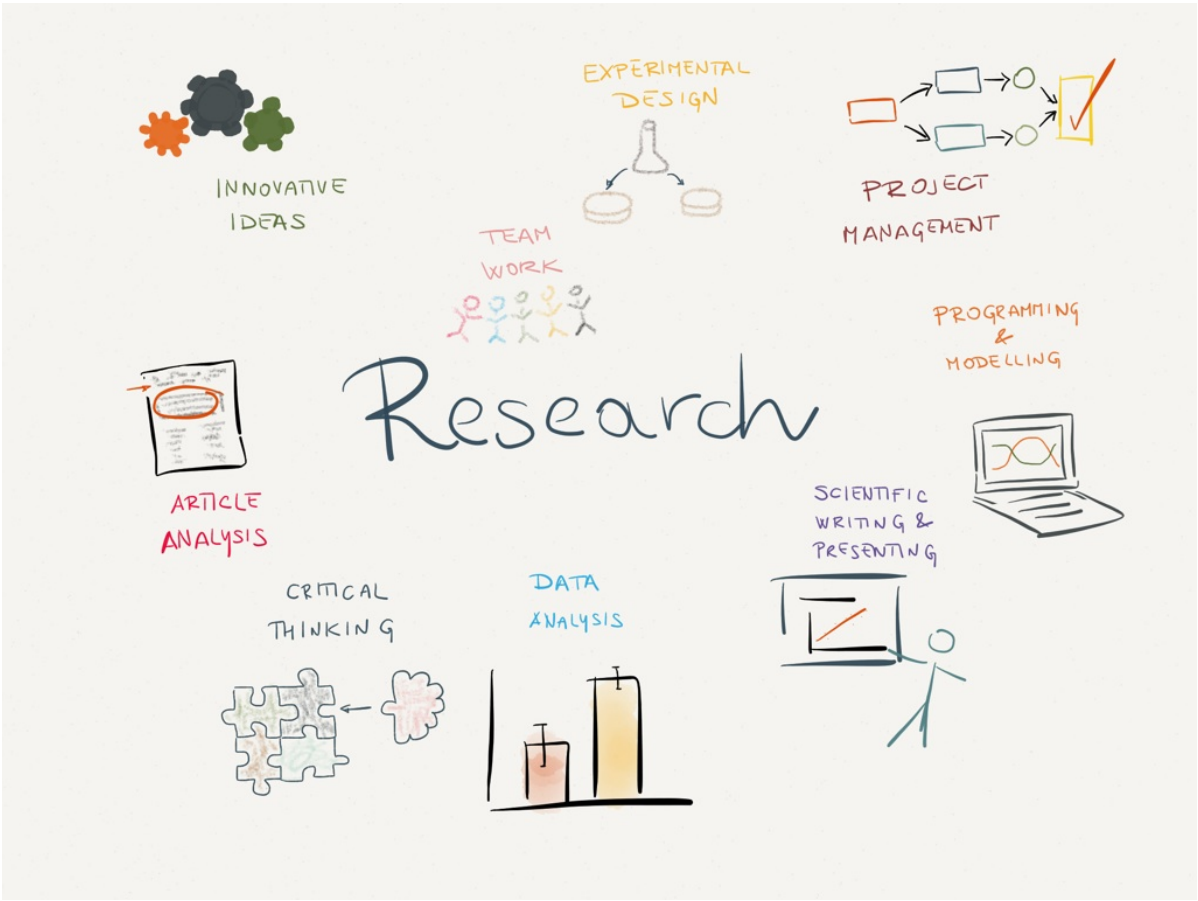
Modules A - Introduction to interdisciplinary life science research (150h)



A1	Interdisciplinary look at evolution (30h)	Revisiting evolution of life on Earth is the goal of this module. Taking into account all physical and chemical constraints of major evolutionary transitions will aim at offering a novel interdisciplinary view of yet unexplained concepts of evolutionary biology.
A2	Physical and chemical limits of living systems (30h)	Interface between biology, physics and chemistry will be a theme of this module. The limits of life will be illustrated through studies of amphibian insects in fieldwork.

A3	Diversity of Microorganisms (30h)	This intensive two-weeks module will cover topics in modern microbiology, including microbial ecology and genomics, microbe interactions with plants, microbial symbiosis and human microbiota, as well as interactions between microbes and the immune system, epidemics, vaccines and antimicrobials
A4	Systems ecology (30h)	Systems ecology module explores the interdisciplinary field of ecology using a systems level approach. Topics will be chosen based on the interests of students, and may include exploration of ecosystems from global to cellular scale, population ecology and coevolution, climate change and biodiversity.
A5	Advances in neuroscience (30h)	This intensive module will take an interdisciplinary look at neuroscience and latest developments in research and methodology, including brain-machine interfaces, modelling of the mind, artificial intelligence and modern neuroscience methods.

Modules B - Innovative science research methods (150h)



B1	Research project (60h)	Group research projects are proposed by the students, to address a relevant scientific question. Project module consists of a preparatory phase where students design the project and experiments, a hands-on phase where students gather their data, and an analysis phase where students analyse the data and write a report.
B2	Experimental design, data analysis and analysis of research articles (60h)	In this module, the student will learn to design experiments, use statistical methods to analyse data sets, use visual methods to present data, interpret the results of the analysis (including understanding controls, measurement errors, sample size, probability and hypothesis testing). The students will also learn how to reading and analyse research articles, as well as how to propose relevant continuation of research.
B3	Programming and modelling for biology (30h)	This module will introduce programming applied to biology. The students will learn how to read code and understand algorithms. They will also learn how to translate a problem description into code allowing them to simulate a model and/or analyse and visualize their data.

Important dates and other information

Applications for International Semester 2014 are being accepted until **November 10th 2013** (23h59 CET). The application must include a CV, a letter of motivation and transcript of academic records, including a proof of enrolment in your university of origin for the year 2013/2014. **The application and all questions regarding the program must be sent to the following email address:** international@fdv-paris.org. Recommendation letters and additional documents are welcome, but not mandatory.

Successful applicants will be informed by email by **November 15th** at the latest, and they are expected to confirm their registration to the program by **November 20th 2013**.

Selected students are required to be in Paris for the whole duration of the program, starting **on January 13th, until June 1st 2014**.

Students selected for International Semester are admitted to the International Semester at FdV program free of charge. We advise all applicants to examine funding and housing options, as well as visa requirements, at Campus France website. http://www.campusfrance.org/en

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