



VRIJE
UNIVERSITEIT
BRUSSEL

**MASTER OF
SCIENCE IN**

BIO LOGY

www.vub.be/biology

**120
ECTS**



WHY VUB?

VUB education shapes strong individuals, critical minds and world citizens

Vrije Universiteit Brussel (VUB) offers high-quality English-taught programmes, supported by state-of-the-art research. Being a student at VUB means learning in an open atmosphere of tolerance and diversity, as well as growing into an independent and critical-thinking individual.

VUB is a comprehensive university that offers education on student-friendly campuses in the cosmopolitan city of Brussels. At VUB, lecturers and assistants are available and approachable to students. Faculty members are on hand to answer questions and teaching often takes place in small groups to ensure close interaction and hands-on experience.

VUB is a dynamic and modern university with almost two centuries of history. We welcome more than 15.000 students, 21% of which are international students from more than 120 different countries.

The root of our academic success

Vrije Universiteit Brussel was founded on the principle of 'free inquiry' as formulated by the French mathematician and philosopher of science Henri Poincaré (1854-1912):

"Thinking must never submit itself, neither to a dogma, nor to a party, nor to a passion, nor to an interest, nor to a preconceived idea, nor to anything whatsoever, except to the facts themselves, because for it to submit to anything else would be the end of its existence."

Personal development, open-mindedness, a positive and critical attitude and a sense of responsibility are values that characterise everyone at our university: from professors and researchers to students and staff members. It lies at the root of our academic success.





Studying Biology in the heart of Europe

Biology is by nature a multifaceted science. Today's biologists face a growing number of research challenges, such as the link between climate change and the ongoing biodiversity crisis, or the emergence of multidrug-resistant bacteria. Such topics require integrative approaches, combining elements from different scientific domains. The Master of Science in Biology at the Vrije Universiteit Brussel includes five graduation options. Each of these allows you to specialise in your research field of interest, while a broad range of electives provide the opportunity to maintain and develop a multidisciplinary scope.



MASTER OF SCIENCE IN BIOLOGY

5 graduation options, 5 excellent ways to start your scientific career

- Ecology & Biodiversity
- Molecular & Cellular Life Sciences
- Herpetology
- Human Ecology
- Erasmus Mundus Masters Course in Tropical Biodiversity & Ecosystems

Regardless of the graduation option you choose, our primary goal is to provide you with the best preparation for your scientific career. Therefore, our graduation options share a number of course units to develop a complementary skill set that meets the current needs of the job market and allows you to become a professional independent scientist:

- Master's Thesis Biology
- Project Writing
- Professional Internship
- Integrated Practicals and/or Field Excursions

Students as scientists

An important part of the master programme involves completing a supervised research project and writing a high-quality scientific report (the Master's Thesis Biology). Depending on your interests in biology, you choose a subject within the research programme of one of the Biology Department's teams, or of an allied research institute outside our university. During your thesis research, you become an active member of such a research team and participate in its daily functioning.

The thesis is conceived as a scientific paper which facilitates publication of the results afterwards, a unique asset compared to other universities. Accounting for 30 ECTS, your thesis is a major part of the second-year curriculum. In addition, if

your research is bound by seasons (depending on bird or mammal migration, amphibian mating, or plant flowering), you may need to start your field work earlier.

Start your scientific career in Brussels

A large fraction of our graduates begin a career in research, at a university or in a specialised research institute. Many others find a job in nature conservation organizations, NGOs, environmental protection, natural history musea, public health institutes and hospitals, or in industry at a pharmaceutical, biomedical, biotechnological or agro-industrial company.

In addition, biologists are involved in environmental policy and governance work at regional, national or international level. And biologists with a vocation to pass their knowledge on to others can start teaching. Regardless of your career choice, the knowledge and skills you acquire during your master's programme in Brussels will be a major asset.

OCEANS & LAKES - VLIR-UOS ICP

Next to the Master of Science in Biology, the biology department of the Vrije Universiteit Brussel also coordinates the two-year programme "Master of Science in Marine and Lacustrine Science and Management" (Oceans & Lakes). This interuniversity programme provides insight into the diversity and complexity of life and biological processes in oceans, seas, lakes and estuaries. It provides the students with strong fundamental and applied knowledge and prepares them for an active role in the scientific research and management of marine and lacustrine systems.

www.oceansandlakes.be



GRADUATION OPTION 1: ECOLOGY AND BIODIVERSITY

This option allows students to gain experience in the research methods used to study the ecology and evolution of organisms found in terrestrial, freshwater and marine ecosystems.

Expert staff teaches up-to-date knowledge on individual organisms, populations, species, communities and ecosystems, backed up by their active research experience in biodiversity, vertebrate and invertebrate ecology, evolutionary ecology, biogeography, plant ecology, plant-animal interactions, conservation genetics of populations and nature management. Students are introduced into ecological research by means of practical field training and excursions in Belgium and abroad. Master's Thesis research can take place on any continent.

* SOME EXAMPLES OF ELECTIVES:

Plant-soil interactions; Biology of Animal Societies; Origin of Life and Paleontological Evolution; Integrated Coastal Zone Management; International Environmental Policy and Law; Tropical Marine Ecology and Restoration; Molecular Phylogenetics and Evolution; Introduction to GIS.

OUTLINE OF THE PROGRAMME

ECTS

Compulsory

| | |
|--|---|
| Analysis of Biological Data | 5 |
| Marine Biology | 5 |
| River & Lake Ecology | 5 |
| Social-Ecological Systems | 3 |
| Biogeography | 3 |
| Fieldtrip Ecology | 6 |
| Functional and Experimental Plant Ecology | 6 |
| Scientific Presentation Skills and Career Planning | 3 |
| Project Writing | 3 |
| Bioethics | 3 |

Electives *

48

Can be chosen from 3 groups

- Conceptual Courses
- Applied Courses
- Practical & Technical skills

Professional Internship

6 or 9

Master's Thesis

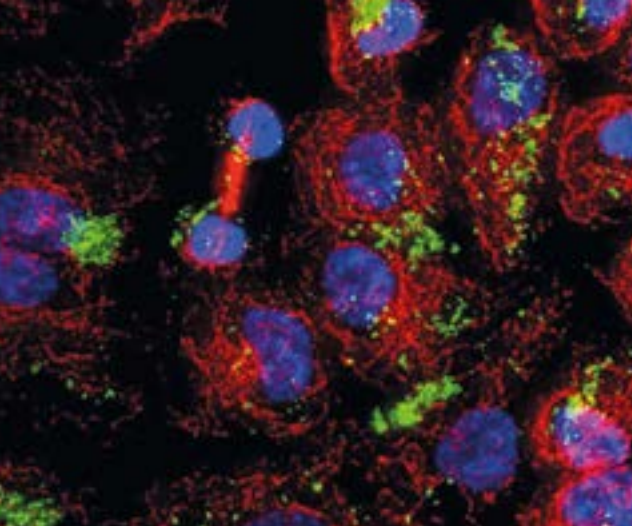
30

The programme is subject to change.

Check www.vub.be/biology for the latest information about the programme.

ECTS (European Credit Transfer System):

1 credit represents 25-30 hours of study activity.



GRADUATION OPTION 2: MOLECULAR AND CELLULAR LIFE SCIENCES

This option introduces students to the study of animal and plant development, microbiology, cell signaling pathways, cancer biology, stem cell biology, human biology, virology and immunology. Courses of this profile span multiple levels of biological organisation, from whole organisms down to the molecular level. Students choosing this profile not only gain detailed insights into these topics but also acquire the laboratory skills required to engage in cutting-edge research. The presence of a highly experienced research staff and state-of-the-art equipment ensures an ideal training ground, and excellent opportunities to enter a PhD programme after graduation or to join the biotechnological or pharmaceutical industry.

| OUTLINE OF THE PROGRAMME | ECTS |
|--|---------------|
| Compulsory | |
| Integrated Practical on Genetics, Cell and Developmental Biology | 6 |
| Scientific Presentation Skills and Career Planning | 3 |
| Project Writing | 3 |
| Bioethics | 3 |
| Some examples of electives: choose 75 credits | |
| Embryonic Stem Cells | 6 |
| Adult Stem and Progenitor Cells | 6 |
| Advanced Developmental Biology | 6 |
| Current Topics in Cell Biology | 6 |
| Molecular Microbiology | 3 |
| Genetics and Reproduction | 5 |
| Beta Cell Therapy in Diabetes | 5 |
| Hematopoietic Celltherapies | 5 |
| Plant Molecular Biology | 6 |
| Cellular Biology and Immunology | 5 |
| Plant Responses to Environmental Stress | 5 |
| Gene Therapy and Gene Editing | 5 |
| Recombinant Antibody Engineering | 3 |
| Bioinformatics | 3 |
| Advanced Aspects of Molecular Pharmacology | 3 |
| Medical Biotechnology and Parasitology | 3 |
| Stem Cell Biology | 3 |
| Microbial Life in Extreme Conditions | 5 |
| Professional Internship | 6 or 9 |
| Master's Thesis | 30 |

The programme is subject to change.

Check www.vub.be/biology for the latest information about the programme.

ECTS (European Credit Transfer System):

1 credit represents 25-30 hours of study activity.



GRADUATION OPTION 3: HERPETOLOGY

Some of the world's finest herpetologists have joined forces to organise this unique programme in Herpetology, the study of amphibians and reptiles. Though organised in the capital of Europe, ecological and herpetological field courses in European and tropical countries form an important part of the programme. As a student, you will be in a stimulating environment, with fellow students and visiting top scientists sharing your passion for amphibians and reptiles. The goal of this programme is to prepare you in a unique way for a professional career in herpetology, but due to the integrative approach and embedding of this option in a standard Biology programme, your degree leaves doors open for any other career in Biology.

OUTLINE OF THE PROGRAMME

ECTS

Compulsory

| | |
|--|---|
| Toxins in Amphibians and Reptiles | 3 |
| Field Trip Herpetology | 9 |
| Systematics, Phylogeny and Natural History of Amphibians | 6 |
| Integrative Herpetology: From DNA to diversity | 3 |
| Population and Conservation Genetics | 3 |
| Conceptual and Integrative Taxonomy in Herpetology | 3 |
| Molecular Phylogenetics and Evolution | 6 |
| Functional Ecology of Amphibians and Reptiles | 3 |
| Natural History of Burrowing Herpetofauna | 3 |
| Systematics, Phylogeny and Natural History of Reptiles | 6 |
| Analysis of Biological Data | 6 |
| Introduction to GIS | 3 |
| Excursion Ecology | 6 |
| Origin of Life and Paleontological Evolution | 3 |
| Animal Behaviour | 3 |
| Integrative Herpetology: EvoDevo and Physics | 3 |
| Scientific Presentation Skills and Career Planning | 3 |
| Biogeography | 3 |
| Advanced Developmental Biology | 3 |
| Project Writing | 3 |

Electives

9

Master's Thesis

30

The programme is subject to change.

Check www.vub.be/biology for the latest information about the programme.

ECTS (European Credit Transfer System):

1 credit represents 25-30 hours of study activity.



GRADUATION OPTION 4: HUMAN ECOLOGY

This option deals with the interactions between humans and their natural environment. The increasing impact of the human population on ecosystems worldwide stresses the urgent need for researchers with a multidisciplinary background that engage in developmental plans for a durable use and management of natural resources.

The programme addresses an international audience of students and offers a course programme that, as well as scientific topics, addresses methodological, socioeconomical and political aspects. This programme provides the ideal basis for young scientists that would like to play a key role in dealing with human ecological challenges in their home countries.

Reduced programme (60 ECTS)

Candidates with a Master degree of a five-stage programme in Biology from an EEA (European Economic Area) university can apply for the reduced Master programme and can be exempted from 60 ECTS of the regular 120 ECTS programme. Applicants should have gained an equivalent of 60 or more relevant ECTS in their previous training. The relevance refers to statistical analyses, knowledge of various ecosystems, aspects of molecular biology and the conductance of a Master thesis. Applications are evaluated on an individual basis.

OUTLINE OF THE PROGRAMME

ECTS

Compulsory

| | |
|--|---|
| River & Lake Ecology | 5 |
| Global Change Biology | 3 |
| Forestry and Agroforestry | 3 |
| Impact Assessment | 4 |
| Analysis of Biological Data | 6 |
| Social-Ecological Systems | 3 |
| International Environmental Policy and Law | 3 |
| Medical Biotechnology and Parasitology | 3 |
| Nature-Based Solutions for Development | 3 |
| Bioethics | 3 |
| UNESCO Biosphere Reserves as Model Systems | 3 |
| Scientific Presentation Skills and Career Planning | 3 |
| Project writing | 3 |

Electives can be chosen from 2 groups: 45

- Risk and Conservation Management
- In Practice

Professional Internship 6 or 9

Master's Thesis 30

The programme is subject to change.

Check www.vub.be/biology for the latest information about the programme.

ECTS (European Credit Transfer System):

1 credit represents 25-30 hours of study activity.



GRADUATION OPTION 5: ERASMUS MUNDUS MASTERS COURSE IN TROPICAL BIODIVERSITY AND ECOSYSTEMS

TROPIMUNDO is a programme funded by the European Commission and excellence-labeled Erasmus Mundus Masters Course in Tropical Biodiversity and Ecosystems. We bring together top institutes and universities, with long-standing worldwide expertise in tropical rainforests and woodlands and in tropical coastal and marine ecosystems. Students can focus on botany, zoology and integrative ecosystem approaches in institutions worldwide in two Master years, of which an entire semester is spent in the tropics.

Scholarships

TROPIMUNDO candidates can apply for an EC scholarship, which is limited by a number of criteria. Only candidates who have applied to and have been accepted by the TROPIMUNDO consortium in accordance with its specific students' application and selection criteria, are eligible.

For more information check www.tropimundo.eu

Self-funding

TROPIMUNDO candidates can also apply on a self-funded basis.

For more information check www.tropimundo.eu

OUTLINE OF THE PROGRAMME

First semester

You start for example at the Brussels Universities (VUB/ULB) to acquire basic competences. The programme of the first semester in Brussels is composed of a number of general courses and a limited selection of specialised courses, based on local expertise and on expertise required for the second semester.

Second semester

In situ field experience and courses will take place in one of the universities in the tropics: Université des Antilles - UdA (Guadeloupe), Université de Dschang - UDsch (Cameroon), Université d'Antananarivo - UNIVANTA (Madagascar), Universiti Malaysia Terengganu - UMT (Malaysia), Université de la Réunion - UNIRé (La Réunion), or University of Ruhuna - RUH (Sri Lanka).

Third semester

Specialisation will be sought at a European university different from where you started.

The Sorbonne Université (SU) and the Musée National d'Histoire Naturelle (MNHN), both in Paris, have a solid expertise in botany (plant taxonomy, phylogeny, bioinformatics and man-plant interactions), and in the management of biological collections, including nearly four centuries of collection of plant and animal specimens.

Università degli Studi di Firenze (UNIFI) has expertise in zoology (faunistic aspects and plant-animal interactions particularly applied to terrestrial and semi-terrestrial ecosystems).

Fourth semester

You return to the VUB/ULB to complete and defend your Master's thesis.

This programme is subject to changes. Check www.tropimundo.eu for the latest information about the programme.

BIOLOGY RESEARCH AT THE VUB

RESEARCH TEAM:

Molecular and Cellular Life Sciences

SELECTED PUBLICATIONS:

- Amorphous silica nanoparticles alter microtubule dynamics and cell migration. *Nanotoxicology* (2014).
- The effect of dietary estimates calculated using food frequency questionnaires on micronuclei formation in European pregnant women: a NewGeneris study. *Mutagenesis*. (2014)
- Lower nucleotide excision repair capacity in newborns compared to their mothers: A pilot study. *Reproductive toxicology*. (2014)

NANOMATERIALS AND EMBRYONIC STEM CELLS

"My journey in the world of biology started one day, when I woke up and said to myself: I want to be a biologist. After 15 years I am still in love with it.

For my PhD thesis in the Laboratory of Cell Genetics, I combined fundamental research with some applied research. I evaluated the potential effects of engineered nanomaterials in altering the differentiation of mouse embryonic stem cells. What does it mean if we relate it to humans? Can engineered nanomaterials be toxic for the developing embryo? I differentiated mouse embryonic stem cells into cardiomyocytes that are very easy to distinguish under microscope, because they are beating cells. This model has been used to study the effect of nanomaterials on differentiating embryonic stem cells. Next to studying the effect of engineered nanomaterials, the main focus in the lab is to study the differentiation of embryonic stem cells, used as a model of the early stage embryo, towards mesodermal and neural fates."

PhD Student Sara Corradi

RESEARCH TEAM:

Biodiversity and Ecosystems

SELECTED PUBLICATIONS:

- Acacia tree density strongly affects N and P fluxes in savanna. *Biogeochemistry* (2015)
- Low investment in sexual reproduction threatens plants adapted to phosphorus limitation. *Nature* (2014)
- Both local presence and regional distribution of predator cues modulate prey colonisation in pond landscapes. *Ecology Letters* (2019)
- The magnitude of global marine species diversity. *Current Biology* (2012)

WANTED: GIANT TORTOISES

"Biologists will usually see and understand things in a unique perspective: from systems to units, from macro to micro, from global to local. We generate this perspective throughout study, reflections, observations and fun. However, outside this community of biologists, views and perspectives can be very different. Human thoughts and actions are linked and they have an effect on our surrounding systems. Over the past years I've been studying these linkages in one of the most well-known natural wonders of the world and famous for biologists: the Galapagos Islands of my home country Ecuador. To study this complex socio-ecological system I use a set of methods both from the social and ecological fields to understand the dynamics that are taking place in Galapagos: environmental impacts and perceptions, conservation discourses, human-wildlife conflicts (giant tortoises and farmers) and decisions analysis for conservation-sustainability management options.

Alumnus Francisco Benitez Capistros

RESEARCH TEAM:

Amphibian Evolution Lab

KEYWORDS:

Amphibians - Natural history - Evolution -
Toxinology - Pheromones - Behaviour.

SELECTED PUBLICATIONS:

- Divergence of species-specific protein sex pheromone blends in two related, nonhybridizing newts (Salamandridae). (Mol Ecol 2018)
- Antimicrobial peptides in frog poisons constitute a molecular toxin delivery system against predators. (Nat Commun. 2017)
- Drivers of salamander extirpation mediated by Batrachochytrium salamandrivorans. (Nature 2017)
- Origin and diversification of a salamander sex pheromone system. (Molecular Biology & Evolution 2015)

UNLOCKING THE SECRETS OF A LOST WORLD

"Like many scientists, my life has been greatly influenced by the reading of adventurers' stories when I was a child, dreaming of exploration and discovery of unknown fabulous animals in untouched places and impressive landscapes.

Since 2007 my main research project focuses on the tepui ecosystem in northern South America where I am trying to disentangle the processes behind the evolution of organisms in these "islands in the sky". Rising hundreds of meters vertically from the surrounding savannas and forests, the summits of individual tepuis are known to harbor high percentages of endemic species of plants and animals that have evolved in isolation over millions of years. My coworkers and I helicoptered on to the summits of 17 tepuis to take tissue samples from amphibian species for genetic analysis. The genetic data suggest that substantial elements of the fauna may be less than 1 million years old—far less than the forbidding nature of the tepuis would seem to predict."

Dr. Philippe J. R. Kok



ADMISSION CRITERIA

Admission is based on the review of each application: proof of meeting academic and language requirements, personal motivation, etc.

LANGUAGE REQUIREMENTS

Prospective students can provide proof of sufficient knowledge of English as language of instruction by meeting one of the following criteria:

- having successfully completed one of the following language proficiency tests:
 - TOEFL: minimum level 79 for the internet-based test (IBT)
 - IELTS: minimum level academic module 6.5
 - ITACE: minimum level B2
 - Cambridge Certificate of Advanced English (CAE), grade B
 - Cambridge Certificate of Proficiency in English (CPE), grade C
- having successfully completed at least one year of secondary education with English as language of instruction, or having successfully completed secondary school in a Belgian institution;
- having successfully completed programme units in higher education with a minimum of 54 ECTS-credits where English was the language of instruction.

For more details on admission requirements and application: www.vub.be/en/apply

DIRECT ADMISSION

The Master of Science in Biology is open to holders of a Flemish Bachelor degree in Biology. For other academic bachelors in science, applied science and life sciences, equivalency will be evaluated based on scientific competences and skills of the students by the Master of Biology Steering Committee.

Application deadline

Prospective students are advised to apply as soon as possible, even if they have not yet obtained their degree. Applications can only be submitted through our website www.vub.be/en/apply

- Students who require a visa (non-EU/EEA nationals) need to submit their application before **April 1st**.
- Students who do not require a visa must apply before **September 1st**.
- Note: if the proof of English proficiency or APS certificate is not ready before the deadline, you can always submit it later instead of missing the deadline.
- For TROPIMUNDO application deadlines and tuition fees are different and can be consulted on www.tropimundo.eu

Tuition fees

All Flemish universities in Belgium are subsidised by the government, which results in relatively low tuition fees. The general tuition fee for our master programmes is €940/year. Some programmes have higher tuition fee for students with a non EU/EEA nationality. A detailed overview of the tuition fees can be found on:

www.vub.be/en/tuition-fees

Contact

www.vub.be/biology