



VRIJE  
UNIVERSITEIT  
BRUSSEL

In collaboration with

**KU LEUVEN**



**MASTER OF  
SCIENCE IN**

# **MOLE CULAR BIOLOGY**

[www.vub.ac.be/molecular-biology](http://www.vub.ac.be/molecular-biology)

**120  
ECTS**

**2019-2020**



# WHY VUB?

## **VUB education creates strong individuals, critical minds and world citizens**

Vrije Universiteit Brussel (VUB) offers high-quality English-taught programmes, supported by outstanding 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 and 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 is often done 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 basis 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 characteristics that you will encounter in everyone at the university: from professors and researchers to students and staff members. It lies at the basis of our academic success.





### **Applying molecular biology to improve life**

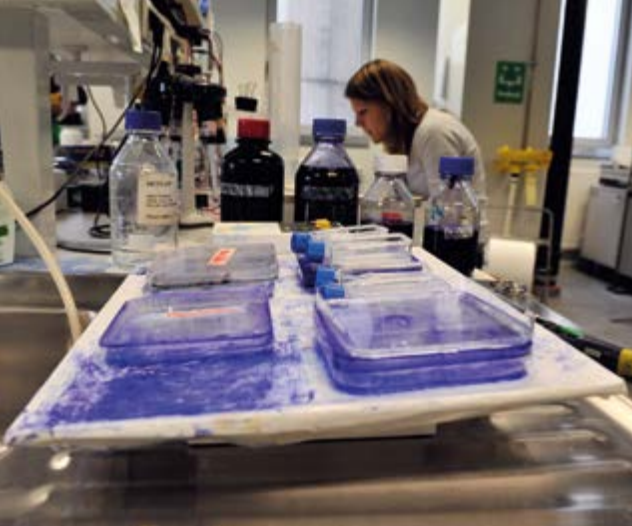
In 2018 two scientific programmes joined forces: the Master in Molecular Biology and the Master in Biomolecular Sciences merged to a high-level scientific programme with strong multidisciplinary courses that combine a theoretical formation with research-oriented skills. Students can choose between the **Profile Biotechnology for Global Health** and the **Profile Agro- and Plant Biotechnology**.

Molecular Biology is a rapidly developing discipline. It stands at the crossroads of chemical, biological, physical and computational sciences and focuses on the understanding of cellular processes, biological molecules and their interactions. Molecular Biology is a multidisciplinary area of study that deals with the structure and function of molecules as well as their interplay in creating the phenomenon of life.

After graduation, you will be able to contribute to the improvement of human health or plant production through a molecular biological approach. You will know how to appraise the scientific and social aspects of applied molecular biology.

We train our students so they can cope with a wide range of scientific problems as well as the development of preventive strategies, diagnostic techniques and therapies, while being aware of the ethical issues related to this field.

A critical mind will allow you to consider and reflect on existing and new theories within the study field and will help you to solve global problems or issues that both developing and developed countries are facing.



# MASTER OF SCIENCE IN MOLECULAR BIOLOGY

Do you have a Bachelor's degree in biology, biotechnology, biochemistry, bioengineering or biomedical science, and are you still fascinated by the biochemical unity that underlies the world's biological diversity? Then the Master of Science in Molecular Biology is the programme you are looking for!

The programme content has been developed by several outstanding and multidisciplinary scientific teams. The advanced courses and electives are taught by leading researchers with a proven scientific track record, thus contributing to the research-oriented nature of the programme. The programme is jointly organised by KULeuven ([www.kuleuven.be](http://www.kuleuven.be)), Vrije Universiteit Brussel ([www.vub.ac.be](http://www.vub.ac.be)) and Universiteit Antwerpen ([www.ua.ac.be](http://www.ua.ac.be)). The two-year Interuniversity Master in Molecular Biology requires full-time attendance and active participation in lectures and discovery-based laboratory work to develop the mentality that drives the progress of science.

## Students as scientists

During practical training, problem-solving formats are used in which students work together to make observations and to analyse experimental results. Students who learn via problem-solving formats demonstrate better problem-solving ability, conceptual understanding and success in subsequent courses than those who learn in traditional, passive ways.

## Research Management Skills

Our students learn to perform and manage research in a multidisciplinary and international context. We train them in various aspects

of research communication and research management. This part of the programme includes a full course on Research Communication Skills (3 ECTS) and a full course on Project Writing and Management (5 ECTS).

## Dissertation or Master's Thesis

Under the direction and supervision of a supervisor, students carry out an independent research project and prepare a dissertation: a written account of the research and its results. During the experimental part of the thesis, you learn to plan and perform experiments and critically interpret the results. You also learn to report both orally and in written, prepare presentations and summarise literature data. You learn to present your work in public and answer questions from a jury and the audience. Any topic is potentially acceptable as long as it offers a real contribution to molecular biology. Priority is given to topics closely related to the student's future work. Given the variety of possible research topics, the student is free to choose any lab, which does not necessarily have to belong to one of the three partner universities.

## Scholarships

The Vrije Universiteit Brussel participates in many scholarship programmes offering grants to all levels of study (from Bachelor to Academic Staff), in various regions, both for short and longer stays. For specific and detailed information, consult the following websites:

[www.vub.ac.be/en/scholarships](http://www.vub.ac.be/en/scholarships)

[www.btcctb.org](http://www.btcctb.org)

[www.flanders.be](http://www.flanders.be)



## PROGRAMME OUTLINE

The Interuniversity Programme in Molecular Biology is structured over two academic years. In view of the diverse background of its students, a pretest in week 1 of the 1st year is organised to test the student's previous knowledge in mathematics, statistics, biochemistry, molecular biology and practical research skills. Any deficiencies will result in a compulsory orientation towards certain electives. By the end of the first year, students will have obtained the level of knowledge required to successfully take part in the advanced common core and specialised courses of the second year. Intensive training in the first year provides students with the laboratory skills to prepare a thesis in the second year.

YEAR 1	ECTS
<b>Electives (Based on previous knowledge)</b>	<b>16</b>
Mathematics and Statistics	3
Biochemistry	3
Molecular Biology	5
Experimental Research Skills	5
High Throughput Techniques	5
Molecular Pharmacology	3
Cell Biology and Cell Signaling	3
Bioinformatics and Omics	5
<b>Compulsory courses</b>	<b>35</b>
Analytical Biochemistry	3
Molecular Microbiology	3
Plant Molecular Biology	3
Immunology	5
Genetics and Genetic Engineering	5
Research Communication Skills	3
Research Rotations I : topics in Molecular Pharmacology; Plant Molecular Biology...	5
Research Rotations II : topics in Immunology; Genetic Engineering; Vaccine Technology; Protein Structure and Function...	8
<b>Profile Biotechnology for Global Health</b>	
Molecular Parasitology	3
Vaccine Technology	3
Protein Structure and Function	3

### Profile Agro- and Plant Biotechnology

Plant Disease Biology and Management	5
Applied Biotechnology in Livestock Production	4

## YEAR 2

ECTS

### Compulsory courses

13

Micro- and Nanobiotechnology	3
Global Biotechnology Challenges	5
Project Writing and Management	5

### Profile Biotechnology for Global Health

<b>Electives (choose 17 ECTS)</b>	<b>17</b>
Some examples: Immuno-Imaging and Molecular Therapy; Stem Cell Biology; Medicinal Chemistry; Human Infectious Diseases...	

### Profile Agro- and Plant Biotechnology

<b>Electives (choose 17 ECTS)</b>	<b>17</b>
Some examples: Biotechnology Regulations; Functional and Experimental Plant Ecology; Plant Breeding; Tropical Crop Production...	

### Master's thesis

30

The programme is subject to change. Check [www.vub.ac.be/en/study/molecular-biology](http://www.vub.ac.be/en/study/molecular-biology) for the latest information about the programme. ECTS (European Credit Transfer System): 1 credit represents 25-30 hours of study activity.

# WORKING AS A SCIENTIST

## START YOUR SCIENTIFIC CAREER IN BRUSSELS

Scientific research in the Brussels-Capital Region is mainly geared towards highly specialised sectors and advanced technologies. Molecular Biology is a rapidly developing discipline in modern life science, and companies need ambitious scientists who understand cellular processes, biological molecules and their interactions.

The problem-solving formats in the programme and courses such as Research Communication Skills are intended to help you to continue your career in research.

Graduates find employment in universities, hospitals, private and governmental research laboratories and patenting bureaus. They can work in the R&D department of a pharmaceutical, food or biotech company, work on environmental protection, develop state-of-the-art equipment in biotechnology, be part of a sales and marketing department or work as lecturers, consultants and advisors to policymakers. Many graduates start a PhD programme in Belgium or abroad.

## IMMUNODIAGNOSTICS TESTS FOR TROPICAL PARASITIC DISEASES

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*"The need to combat the prevailing diseases such as cholera, ebola, polio and African trypanosomosis were the key driving forces that compelled me to pursue further training. Through a VLIR-UOS scholarship, I set foot at the Vrije Universiteit Brussel where I was trained on a number of important molecular techniques and basic research concepts. I was granted a VUB scholarship to continue with a PhD programme. Looking back to where it all started, I can confidently say that the knowledge I gained is enormous. I have contributed to supervision of students, co-authored a book and participated in a number of technology transfer seminars. Thus, with all this experience I'm in a better position to resume my teaching position in Makerere University (Uganda) and I look forward to starting a research group on development of affordable immunodiagnostic tests for tropical parasitic diseases."*

Steven Odongo  
PhD student

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## A JOURNEY INTO THE MOLECULAR WAY OF LEARNING

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*During the practical training I discovered a very attractive specificity: the field of cancer immunology. I did my master dissertation on this research topic. It was a difficult year. However, carrying out research gave me so much knowledge and experience that I just kept trying until I had interesting results. After finishing the programme, my only wish was to become a PhD student on the topic of macrophages, the top regulators of immune responses that induce cancer growth and metastasis. The depletion of these protumoral macrophages could be a novel cancer therapy. What I learned is that if you really want something, you should work for it. Nothing is impossible; all you need is perseverance and a bit of luck."*

Evangelina Bolli  
PhD student

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## **ONGOING RESEARCH**

The Vrije Universiteit Brussel has a sound reputation in training and in basic and applied research in molecular biology and biotechnology. Since the biotech revolution in the 1970s, interest in applied biotechnology has grown steadily. Our major discoveries at the Vrije Universiteit Brussel include:

- the first development of a genetically modified plant
- identification of a unique class of camel antibodies with far-reaching implications in biotechnology and medicine
- development of pioneering technology for analysis of protein structure
- breakthroughs in the knowledge of the role of macrophages in cancer and parasitic infections
- elucidation of the action mechanism of antihypertensive drugs
- innovative techniques in the culture of microorganisms involved in fermented food products

## 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.ac.be/en/apply](http://www.vub.ac.be/en/apply)

### SPECIFIC ADMISSION REQUIREMENTS

Holders of a Bachelor's or Master's degree awarded by a Flemish university in one of the following disciplines are eligible for direct admission to the programme: bioengineering sciences; biochemistry and biotechnology; biology; biomedical sciences. For other Flemish diplomas in a related discipline (e.g. chemistry; veterinary medicine; pharmaceutical sciences; medicine), admission decisions are based upon evaluation of a complete application file. For holders of a Bachelor's or Master's degree awarded by a non-Flemish university in one of the above disciplines, admission decisions are based upon evaluation of a complete application file.

### 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.ac.be/en/apply](http://www.vub.ac.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.

### • 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 €920/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.ac.be/en/tuition-fees](http://www.vub.ac.be/en/tuition-fees)

### Contact

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