

REALIZE YOUR MASTER PLAN IN BRUSSELS



WE

FACULTY OF
SCIENCE

Master of Biomolecular Science

Duration: 2 years

Start date: Last week of September



Vrije Universiteit Brussel

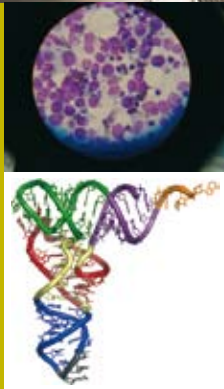
Realize your master plan in Brussels

The Institute of Molecular Biology and Biotechnology.

Since its establishment in 1969, the Vrije Universiteit Brussel acquired a sound reputation in training and basic and applied research in molecular biology and biotechnology. Indeed, our French foster-university, the Université Libre de Bruxelles, was internationally recognized for its research in molecular biology. Building on this expertise, the Vrije Universiteit Brussel established its Institute of Molecular Biology (IMOL) from the start. Initially, our institute primarily attracted molecular biologists in the disciplines of microbiology, genetics, biochemistry, plant science and immunology. Following the biotech revolution in the seventies, the interest in applied biotechnology has grown steadily. A few of the major discoveries at IMOL 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 the analysis of protein structure
- breakthroughs in the knowledge of the role of macrophages in cancer and malaria
- elucidation of the action mechanism of antihypertensive drugs
- innovative techniques in the culture of micro-organisms involved in fermented food products

Today, the research at IMOL is at equilibrium between fundamental aspects of molecular biology and biotechnological applications.



Outline of the MSc of Biomolecular Science program

Because our two-year program has a strong emphasis on performing research, the program will require **full-time attendance** and will involve **active participation in lectures and discovery-based laboratories** to develop the habits of mind that drive the progress of science.

The student who will focus on **Structural Biology and Biochemistry** will gain expert research qualifications in the following subjects:

- Enzymology
- Structure determination of proteins
- Structure-function and synthesis of biologically active (macro)molecules
- Synthesis and applications of fine chemicals
- Structural bioinformatics

The student who will focus on **Cell- and Developmental Biology** will gain expert research qualifications in the following subjects:

- (Molecular) immunology and parasitology
- Developmental biology
- Molecular evolution
- Plant molecular biology

The students will follow a full time program with the following outline:

1st year:

- Guided self-study (2 x 5 ETC's)
- Four advanced courses (4 x 5 ETC's)
- Three research training rotations (3 x 10 ETC's)

2nd year:

- One advanced course (5 ETC's)
- Five electives (5 x 3 ETC's)
- Research communication and management (10 ETC's)
- Master thesis (30 ETC's)

The two years multidisciplinary program is built around 8 advanced courses that define the general character and scope of the Master. The advanced courses cover the essential elements of molecular biology, genetics, biophysical chemistry and cellular biology. Each student will select 5 of these advanced modules, thus emphasizing more molecular or more cellular aspects in the core of his/her program. The rest of the program is tailor-made. Depending on the research interests

and future career prospects, the student can design his/her program by selecting 3 research training rotations, 5 electives, and a subject for his/her master thesis. Research training topics, electives and the Master thesis cover advanced and highly specialized topics. The study concludes with a training in scientific communication and the writing of a research proposal.

Guided self-study (5 ETC's each): The aim of this guided self-study is to allow the student to acquire the background knowledge in molecular biology, biochemistry and biophysical chemistry needed for the core curriculum. As students in the Master program in Biomolecular Science will have a variety in background, an appropriate consolidation phase is needed at the start of the program. The contents of this phase will be determined on an individual basis at the start. The result of this phase is that each student has acquired the needed prerequisites in:

- Biochemistry
- Genetics
- Biophysics
- Microbiology
- Molecular cell biology

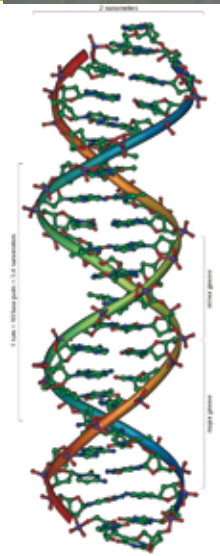
To help the students in studying this material, individual tutors will be assigned to guide each student to assimilate the subject matter.

Advanced courses (5 ETC's each): Advanced courses are courses that define the general character and scope of the Master. The advanced courses will be balanced entities, built up from lectures, interactive tutorials or reading exercises. The advanced courses are:

- Molecular biophysics
- Protein structure and function
- Molecular biology
- Cell biology
- Plant molecular biology
- Molecular microbiology
- Developmental biology
- Bio-informatics

Electives (3 ETC's each): To complete their program, students may spend 15 ETC's on courses that are individually selected. The following electives are part of the core curriculum:

- Enzyme kinetics
- Enzyme mechanisms
- Bio-statistics
- Molecular parasitology
- High throughput techniques
- Molecular phylogenetics & evolution
- Immunochemistry
- Protein crystallography
- Microbiology of extreme environments
- Stem cell biology
- Bacterial genetics and genomics
- Micro- and nanobiotechnology
- Protein trafficking and posttranslational modification
- Molecular pharmacology
- Cellular microbiology



Research training rotation (10 ETC's each): The research training rotation involves three 4-week discovery based projects in different research fields of interest, related to Biomolecular Science. These research trainings will be performed on an individual basis within the research labs under the supervision of an experienced post-doc. Each research training project will focus on a particular advanced technology ranging from genetics to cell biology to structural biology. Nevertheless, each research training project must be interlaced with the learning of basic skills, tools and methods of molecular biology (including electrophoresis, basic spectroscopic methods, simple bio-informatics tools, genetic engineering tools, ...). Examples of representative research training topics are:

- Advanced protein purification
- Fast kinetics
- Atomic force microscopy
- DNA-protein interactions
- Antibody engineering
- Parasite diagnostics
- Molecular phylogenetic analysis
- Gene expression analysis
- Bacterial genetics and genomics
- Plant molecular genetics
- Cellular immunology
- X-Ray crystallographic methods
- Biophysical methods

Master thesis (30 ETC's): To obtain a Master's degree, a student must carry out, under the direction and supervision of a promoter, an independent research project and prepare a thesis, that is, a written account of the research and its results. For an overview of possible research projects, consult our website: <http://biomol.vub.ac.be/science>.

Research Communication and Management (10 ETC's): This part of the program includes the presentation of the master thesis in the context of a mini-symposium, the writing of the results in a publication format, seminars on intellectual property rights and the writing of a research proposal. This can be a proposal for a continuation of the thesis project, a proposal for a PhD project, or a proposal for another research project in Biomolecular Science, which is intended to help the students to continue their career in biomolecular research.

Students as scientists

In response to the contemporary challenges we choose for a **competence oriented learning** concept. A student oriented and student-activating approach with a focus on independent learning and critical assessment is vital to competence-oriented learning. It follows that the lecturer's accent will shift from transfer of knowledge to tutoring.

Active participation in lectures and in discovery based laboratories helps students develop the habits of mind that drive science. Courses that rely on "transmission of information" and "cookbook" laboratories are not highly effective in fostering conceptual understanding or scientific reasoning. In this program, "problem-solving" based formats in which students work collaboratively to make observations and to analyze experimental results will be put in place of "transmission of information" based lectures. Students who learned via "problem-solving" formats will demonstrate better problem-solving ability, conceptual understanding, and success in subsequent courses compared with students who learn in traditional, passive formats.

In the context of the research training rotation, the traditional "cookbook" laboratories will be organized as open-ended, inquiry-based labs. All Master students will individually conduct original research in a professor's research lab. This opportunity is challenging for the instructors but teaches students the essence of investigation.



Theory and research–skills interlaced

The focus and the content of the program have been delineated by and will be fostered by a number of outstanding and multidisciplinary scientific teams within the institute. The embedding of the program in this high level scientific environment is our breeding ground for a strong multidisciplinary program that interlaces theoretical formation with research-oriented skills.

To endorse the research-oriented nature of the Master, the advanced courses and the electives will be taught by leading researchers with a proven scientific track record. The research training rotations link up with the advanced courses and the electives and will take place in the research labs under the guidance of experienced postdocs.

Admission

For admission in the Master of Biomolecular Science, students need a Bachelor's degree in the area of biology, chemistry, or biomedical science or equivalent. Equivalency will be evaluated case by case by the examination board. The examination board will in parallel assess the consolidation needs for each candidate and define the content of the guided self-studies on an individual basis (see above).

In order to be admitted to the program, the students need to be proficient in English or Dutch. A certificate of good command of English is ALWAYS required (except for native speakers). The score of the English language test should be at least:

- TOEFL paper: 580
- TOEFL computer: 237
- IELTS: 6.5 (and 6.0 for written part)
- Cambridge EFL Advanced English: B
- Cambridge EFL Proficiency in English: C

The examination board reserves the right to interview preselected candidates, either by inviting the students, or by conference call.

Registration

Belgian students with an appropriate Bachelors degree may register throughout the year. For foreign students, the admission committee will need to assess whether their education so far satisfies the entrance requirements for this program. Using the electronic form (<http://biomol.vub.ac.be>), you can pre-register for the two-year Master of Biomolecular Science. Based on this information, our program director and his staff will evaluate if you are eligible to register to the program. We only accept pre-registration through this form. All correspondence will proceed via electronic mail. No reply will be sent to applicants who fail to enclose all required information.

Tuition Fees



In general, Belgian Universities do not charge tuition fees to Belgian students. The same principle applies for this International Master program. Similar to Belgian students, EU and Non-EU students may enroll without paying tuition fees.

The yearly enrollment fee of 525 € will be the same for Flemish, EU and non-EU students. This fee does not cover accommodation, travel, textbooks or study materials. An additional fee of 480 € will be charged to non-EU citizens to cover social security.

Because there are no tuition fees to be payed, the Vrije Universiteit Brussel does not offer Scholarships.

Need to know more?

Consult the website: <http://biomol.vub.ac.be>
Or contact: biomol@vub.ac.be



Living in Brussels

Brussels is one of the most cosmopolitan cities in the world. The Brussels-Capital Region is one of Belgium's three regions, but it is also a city with 19 municipalities, covering 162 km² that houses a million inhabitants. It is officially bilingual (French and Dutch), although it boasts an astonishing variety of cultures, styles and nationalities.

Brussels is the Headquarters of the European Commission, the European Council, the European Parliament, the Committee of the Regions and the European Economic and Social Committee. The city also hosts N.A.T.O. and more than 120 international governmental organizations and approximately 1,400 non-governmental organizations. With 159 embassies and 2,500 diplomats, Brussels ranks second in the world in terms of diplomatic representations. Thus, the importance of Brussels is not just confined to European affairs. The city has such a wide impact on the world at large that it has become an extremely attractive place for doing business. As the decision-making heart of Europe, it has become an international capital, where opinion leaders from all over the world meet to use their influence in policy making decisions as well as to do business. Nevertheless, it remains intimate enough to allow its inhabitants to enjoy all the advantages of a vibrant city.

Being the capital of an expanding Europe, Brussels is an international city like no other. Of the population, 31% is of foreign origin, and this makes for a unique atmosphere in which cultures interact easily with one another. Language is not a barrier in the capital of Europe.

The Brussels-Capital Region is one of the European hubs of scientific research and advanced technologies. It has adopted a proactive policy based on its natural assets: the presence of university centres of excellence, including the Vrije Universiteit Brussel, and four industrial higher education institutes, three faculties of medicine and university hospitals, as well as several public and private research centres. Against this lively intellectual background, university research centres are closely linked with Brussels-based companies involved in the high-tech sector. Scientific research in the Brussels-Capital Region is mainly geared towards highly specialised sectors and advanced technologies such as information technology, using state-of-the-art equipment and procedures; electromechanical engineering; biotechnology and life science; medical research and environmental protection.

