Marine Microbiology (MarMic)
Master
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Description of the Study Program

Marine microorganisms are essential to the maintenance of our biosphere, yet we have only fragmentary understanding of the diversity and function of the microbial life in our oceans. The study of marine microbiology involves research of fundamental issues such as the evolution of life, the cycling of the elements, the functioning of marine food webs, global climate change, the fate of pollutants, and the biodiversity of the ocean.

The Marine Microbiology (MarMic) concept is unique: we educate a new generation of marine scientists, and provide them with the tools to better understand microbial life and the matter in which it affects our biosphere. MarMic students are trained to think globally and to choose from both holistic and reductionistic research approaches. The breadth of theoretical and practical experiences at MarMic enables students to address questions ranging from biogeochemistry to genomic analysis and bioinformatics, from single-cell interactions to behavior in mixed communities and foodwebs. These abilities make MarMic students attractive scientists for international research teams, institutes, universities, and industry.

Admission Criteria and Requirements

The admission regulations specify the admission requirements and selection criteria of the master’s program. The information provided below is an excerpt of the admission regulations from January 22, 2014 and refers to winter semester 2018/19. Please recheck the current requirements as they are subject to change: www.uni-bremen.de/en/master

To be considered applicants need to provide:

- A proof of a bachelor’s degree or its equivalent in biology, biochemistry, marine biology, oceanography, chemistry, geology, (bio)informatics, physics, or a similar area of study worth 180 credit points (CP) according to the European Credit Transfer and Accumulation System (ECTS) (or equivalent). Students whose degree is pending may apply nonetheless if they have completed a large part of their studies (corresponding to at least (120 CP).
• A **proof of proficiency in English at the level of C1** (according to the Common European Framework of Reference for Languages CEF) or higher unless the last academic degree was obtained from a university in which the primary language of instruction was English. Information on language certificates accepted as proof of C1-Level can be found at www.fremdsprachenzentrum-bremen.de/EngZert.

• A **CV** (Curriculum Vitae)

• A **letter of motivation** (1-2 pages). Please explain your reasons for wanting to enter the program and study marine microbiology. Refer to any personal, professional, or educational experiences or situations that have contributed to your desire to participate in this program. Describe your specific interests and academic goals.

• **Two reference letters**: letters of two referees who are able to evaluate your personality, academic experience, and intellectual merit (preferably mailed to the MarMic coordination office confidentially. They should not be older than 6 months).

Information on the required application documents (official certification, translation, health insurance, language certificates etc.) can be found at: www.uni-bremen.de/en/master/faq/

The best applicants will be invited to a written aptitude test and two interviews.

**Expected Interests and Qualifications**
Basic knowledge of biological, chemical, geological problems or issues and research tools are recommended, lab experience in these research fields is desirable.

**Occupational Fields and Career Opportunities**
Possible fields for future employment are universities, industrial research and development, consultant agencies for environment and administration, management and planning of natural/marine resources.

**Curriculum**
MarMic is an 18 months fast track master study program (120 Credit Points/ECTS). The first year of the training program runs continuously from October until July of the following year with short breaks in December and in
April. It combines intensive practical training in the research laboratories of the participating faculty with intensive theoretical training.

Throughout the first year, current topics in marine microbiology are taught by internationally renowned scientists in a comprehensive lecture series. Lecture topics are discussed in tutorials. During methods courses students learn fundamental techniques applied in current research and meet members of participating research groups. Subsequently, students carry out three independent research projects (laboratory rotations) of 6 weeks each in participating laboratories. Results of these projects are presented and discussed during minisymposia.

For details about the current curriculum please see marmic.mpg.de

In the last 6 months, students work on their M.Sc. thesis in a research group of the University of Bremen, the Max Planck Institute for Marine Microbiology, the Alfred Wegener Institute Helmholtz-Center for Polar & Marine Research (AWI), Leibniz Center for Tropical Ecology (ZMT) or the Jacobs University Bremen.

**Lecture Series in Marine Microbiology**

The lecture series on marine microbiology provides a theoretical background for MarMic students.

The lectures cover the following topics:

I. **General introduction to marine microbiology and oceanography**
   (Prof. Dr. Michael Friedrich, Prof. Dr. Frank-Oliver Glöckner, Prof. Dr. Jens Harder, Prof. Dr. Nicole Dubilier, Prof. Dr. Antje Boetius)
   - Chemical and physical features of marine microbial environments
   - Principles of the marine sulfur, nitrogen, and carbon cycle
   - Pelagic and benthic environments
   - Microbial associations: mats, biofilms, symbioses microbial life in extreme environments: deep-sea, sea-ice, etc.

II. **Biogeochemistry of marine environments**
   (Prof. Dr. Marcel Kuypers, Dr. Dirk deBeer, Dr. Christian Borowski, Prof. Dr. Wolfgang Bach, Dr. Christoph Völker, Prof. Dr. Thorsten Dittmar, Dr. Timothy
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- General principles of marine biogeochemistry
- Transport processes in marine sediments
- Biogeochemistry of the carbon, nitrogen, and sulfur cycles

III. Physiology of marine prokaryotic organisms
(Prof. Dr. Michael Friedrich, Prof. Dr. Jens Harder, Prof. Dr. Karlheinz Altendorf, Dr. Boran Kartal, Dr. Tristan Wagner, Dr. Jan-Hendrik Hehemann, Dr. Solveig Bühring)
- General biology of marine prokaryotes ecology and physiology of marine prokaryotes
- Prokaryotes of the marine sulfur, nitrogen, phosphor, and carbon cycles
- Aerobic and anaerobic environments
- Symbiotic interactions between bacteria and eukaryotes
- Biochemistry of microbial interactions

IV. Biology of planctonic and benthic microorganisms and algae
(Prof. Dr. Michal Kucera, Prof. Dr. Allan Cembella)
- General biology of benthic and planktonic marine eukaryotes
- Ecology and physiology of benthic eukaryotes
- Principles of plankton ecology and evolution
- Role of phytoplankton in the global carbon cycle and climate change

V. Molecular ecology of marine microorganisms & bioinformatics
(Prof. Dr. Rudolf Amann, PD Dr. Bernhard Fuchs, Prof. Dr. Nicole Dubilier, Prof. Dr. Matthias Ullrich, Prof. Dr. Frank Oliver Glöckner, Prof. Dr. Uta Bohnebeck, Prof. Dr. O.Herzog; Dr. Hanno Teeling, Dr. Pier Luigi Buttigieg, Dr. Manuel Liebeke, Prof. Dr. Andreas Dotzauer)
- General principles of molecular microbial ecology symbiosis and parasitism,
- Marine virology, phylogeny/genomics of marine microorganisms,
- Molecular ecology of planktonic, benthic and symbiotic marine microorganisms
- Bioinformatics and statistics
Methods Courses in Marine Microbiology

Basic practical courses train students in theory and practice in methods used in marine microbiological research. Students receive an intensive training in each of the disciplines listed below, and become familiar with the wide array of techniques used in the field of marine microbiology by the end of these courses. This intensive, yet broad training, with emphasis on the links between the disciplines give the students the basis they need for learning to use synergistic and interdisciplinary methods in their future research.

The following disciplines are covered:

I. Biogeochemistry
   - Flux and transport studies in marine sediments
   - Techniques for measurements of biogeochemical processes
   - Microanalytical techniques
     (microsensors, microimaging, 14C-imaging, NanoSIMS)
   - Modelling of biogeochemical processes

II. Prokaryotic microbiology and molecular ecology
   - Isolation and identification of marine prokaryotes
   - Aerobic and anaerobic techniques of cultivation
   - Quantification of microbial biomass and activity
   - Role of prokaryotes in element cycling
   - Molecular techniques of detecting of unknown prokaryotes

III. Ecophysiology of eukaryotic microorganisms
   - Sampling and isolation, identification, cultivation
   - Methods: analysis of cellular components and products, ions, low molecular weight compounds (HPLC, mass spectroscopy, MALDI-TOF, gas chromatography, enzymatic estimation)

IV. Molecular ecology and genetics of marine microorganisms
   - Methods: PCR, cloning, sequencing, fluorescence in situ hybridization (FISH), phylogenetic analyses, genomics, differential gene expression, bioinformational analysis
   - Habitats: plankton, sediments, deep sea vents, ice deserts, biofilms, symbioses.
Cooperation for a Joint Graduate Program
MarMic is a joint program of the Max Planck Institute for Marine Microbiology, the University of Bremen, the Alfred-Wegener-Institute for Polar and Marine Research, and the Jacobs University Bremen. The International Max Planck Research School of Marine Microbiology (MarMic) is a M.Sc./Ph.D. graduate program for highly qualified and motivated national and international students.

Language of Instruction
The program is taught completely in English.

Start of the Study Program
Lecture series and practical courses start on October 1st each year.

Duration of Study
1.5 years

Degree
Master of Science (M.Sc.)

Faculty
The faculty is composed of 40 members: 5 of University of Bremen, 17 of the Max Planck Institute of Marine Microbiology, 5 of the Alfred Wegener Institute for Polar and Marine Research, 2 of Jacobs University Bremen.

Number of Students in the First Semester
Max. 20 each year

Fees and Accommodation
The semester fee will be approximately 350 Euro per semester. It includes the use of public transportation in Bremen and the region around. For current information see www.uni-bremen.de/en/semester-contribution. After fourteen semesters of study in an EU- or EEA- country or after reaching the age of 55, students have to pay an additional fee of 500 Euro. Information about the long-term tuition fees can be found at www.uni-bremen.de/en/tuition-fee.
General information about the city of Bremen and rental accommodation can be found at www.bremen.de and www.uni-bremen.de/en/accommodation.

Students moving to Bremen receive 150 Euro as a welcome gift.

For information on study finance and jobs see www.uni-bremen.de/en/student-finances.

**Information for international students concerning visa, health insurance and finances** can be found at www.uni-bremen.de/en/studentstatus

**Information about university services**: www.uni-bremen.de/en/consultation

### Admission and Application

**Application closing date**

For the winter term the application deadline is: **March 15**.

There is only one application deadline each year!

It is possible to apply as an undergraduate student without having completed the bachelor’s studies, if the applicant has earned at least 120 out of a total of 180 credit points by the application deadline (March 15). For preliminary admission, all other requirements with exception of the language proof have to be fulfilled. If the application is successful, applicants will have to provide evidence of having obtained their bachelor’s degree and the required language certificates two weeks after the official start of the lecture period at the latest.

**Applications are to be submitted online at:**

www.uni-bremen.de/en/master

Applications are to be submitted online via the Master Portal of the Admission Office under www.uni-bremen.de/en/master. The online application form is activated about 8 weeks before the application deadline. For special applications (for example, admission to a higher semester or special hardship), use only the forms provided online by the University of Bremen. You will be notified of all required documents for enrollment together with the confirmation of admission / registration.
Student and Admission Office
Contact point for all formalities regarding admission and enrollment, re-registration, leave of absence, change of address.
Visiting address: Bibliothekstraße 1, Verwaltungsgebäude (VWG),
Ground floor
Postal address: Universität Bremen
Sekretariat für Studierende
Postfach 33 04 40
28334 Bremen
phone: +49 421 218-61002
master@uni-bremen.de
www.uni-bremen.de/en/master
Visiting hours: Mo, Tue & Thu 9–12 a.m., Wed 14–16 p.m.
(no advanced notification necessary)

Contact and Advisory Services
Internet address of the study program
www.marmic.mpg.de

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University Services
www.uni-bremen.de/en/consultation

Service and Information for International Students
(Accommodation, jobs, finances, language learning)
www.uni-bremen.de/en/offers-international-students/

Information and Advice on Visa Matters and Social Security
www.inneremission-bremen.de/beratungen/internationale_studierende/
www.uni-bremen.de/bsu/ (see menu: Ausländerangelegenheiten)

Student Representatives for the Whole University
General Students' Committee (AStA)
Services include: Advice on BAföG student grants, social counseling, and childcare
AStA-Etage, Studentenhaus (StH)
www.asta.uni-bremen.de/asta-services/

Last update: 1/2019 (Ka)
Central Student Advisory Service

Visiting address:
Bibliothekstr. 1, Verwaltungsgebäude
Ground floor

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Postfach 33 04 40
28334 Bremen
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www.zsb.uni-bremen.de

Advisory hours (no advanced notification necessary):
Mo, Tue & Thur 9–12 a.m.
Wed 14–16 p.m.
Additional appointments by agreement