Modulhandbuch

Biology - Master's Programme

im Wintersemester 2023/2024

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**Background Modules**

**bio605 - Molecular Genetics and Cell Biology**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Molecular Genetics and Cell Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module abbreviation</td>
<td>bio605</td>
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<tr>
<td>Credit points</td>
<td>12.0 KP</td>
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<tr>
<td>Workload</td>
<td>360 h</td>
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<td>Applicability of the module</td>
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- Master’s Programme Biology (Master) > Background Modules
- Master’s Programme Molecular Biomedicine (Master) > Background Modules
- Master’s Programme Neuroscience (Master) > Background Modules

<table>
<thead>
<tr>
<th>Responsible persons</th>
<th>Neidhardt, John (module responsibility)</th>
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<tr>
<td></td>
<td>Koch, Karl-Wilhelm (Prüfungsberechtigt)</td>
</tr>
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<td>Jüschke, Christoph (Prüfungsberechtigt)</td>
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| Prerequisites | BSc (Biologie, Biochemie) |

<table>
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<tr>
<th>Skills to be acquired in this module</th>
<th>++ deepened biological expertise</th>
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<tr>
<td>++ deepened knowledge of biological working methods</td>
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<tr>
<td>+ data analysis skills</td>
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<tr>
<td>++ interdisciplinary thinking</td>
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<tr>
<td>+ critical and analytical thinking</td>
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<tr>
<td>+ independent searching and knowledge of scientific literature</td>
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<tr>
<td>+ data presentation and discussion (E) (written and spoken)</td>
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<tr>
<td>+ teamwork</td>
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<tr>
<td>+ ethics and professional behaviour</td>
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<tr>
<td>+ project and time management</td>
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</table>

Addressing students with an emphasis on molecular biology, molecular genetics, cell biology, and neurobiology.

| Module contents | Lecture: To improve knowledge in molecular genetics, molecular biology and cell biology in correlation with human diseases. Exercise: Learn to transfer the theoretical knowledge to experiments. Gaining methodological knowledge in molecular genetics, cell biology and therapeutic approaches. Initial training on how to perform research projects. Subjects of the lecture and seminar: Molecular bases of neurodegenerative diseases, structure and function of DNA/RNA/proteins/membranes, cytoskeleton, cell cycle, programmed cell death, cells in the social structure. Exercises: Learning current methods of molecular biology and human genetics; high throughput technologies, introduction to cell cultivation techniques. |

| Recommended reading | Textbooks of Cell Biology |

| Links | http://www.uni-oldenburg.de/humangenetik/ |

| Language of instruction | English |

<table>
<thead>
<tr>
<th>Duration (semesters)</th>
<th>1 Semester</th>
</tr>
</thead>
<tbody>
<tr>
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<td>winter term</td>
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<tr>
<td>Module capacity</td>
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| Reference text | associated with bio900 |

| Module level | MM (Mastermodul / Master module) |

| Type of module | Wahlpflicht / Elective |

| Teaching/Learning method | Lecture, seminar, exercise |

| Previous knowledge | Basic knowledge in cell biology, genetics, biochemistry |

<table>
<thead>
<tr>
<th>Examination</th>
<th>Examination times</th>
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| Final exam of module | written examination (70 %), paper(s) presentation 30 %; not graded: signed lab protocols, regular active participation is required for the module to be passed. |

<table>
<thead>
<tr>
<th>Type of course</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>2</td>
<td>WiSe</td>
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<td>5</td>
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<td><strong>Total module attendance time</strong></td>
<td></td>
<td></td>
<td></td>
<td>112 h</td>
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</table>
The aim of the module is to consolidate various aspects of ornithology. The module imparts advanced knowledge on different aspects of ornithology.

The students acquire:

- An extended knowledge of behavioural, sensory, morphological and physiological characteristics in birds and relevant fundamental concept in conservation, ecology and evolution morphological and physiological fundamentals and the resulting ecological and behaviour-biological consequences in birds
- Knowledge, presentation and discussion of relevant English literature from various fields of ornithology
  - ++ broad and deepened biological expertise
  - + deepened in depths knowledge of biological working methods
  - + interdisciplinary thinking
  - + critical and analytical thinking
  - + independent searching and knowledge of scientific literature
  - ++ data presentation and discussion in German and English (written and spoken)

The module is composed of the lecture “Ecology, evolution and sensory biology in birds”, a seminar accompanying the lecture “Current Questions in Ornithology”, a seminar “Behavioural Ecology of Birds”, and a seminar “Methods in Field Ornithology”.

Lecture “Ecology, evolution and sensory biology in birds”:

This lecture covers in-depth and specific aspects of phylogeny, speciation and hybridisation, bird migration, orientation, behavioural ecology, population biology, life history and sensory systems of birds. Seminar “Current Questions of Ornithology”:

In this seminar, original English publications are presented and discussed which deal with current research results from various fields covered in the lectures. Every student reads a paper on one scientific article, presents the study and discusses the results of that article with the other participants.

Seminar “Behavioural Ecology of Birds” (option 1):
In the seminar, current literature relating to the life history of birds will be reported. During the term, each participant is presenting an original paper in a short talk and the group of students will be guided to critically discuss the paper.

Seminar “Methods in Field Ornithology” (option 2):

The core methods of field ornithology, such as stable isotopes, bird census, ringing, radar, radio tracking, etc., will be introduced with the help of English scientific papers by the students. In the presentations the corresponding methods will be explained in detail with an emphasis on the pros and cons of the method. The aim of this seminar is to learn how to deal with scientific methods in a critical way.

Recommended reading

Bairlein F (2022) Das große Buch vom Vogelzug: Eine umfassende Gesamtdarstellung. AULA-Verlag


Links

Participating Institution: Institute of Avian Research für Vogelforschung

Language of instruction English

Duration (semesters) 1 Semester

Module frequency winter term

Module capacity 30

Reference text associated with bio663

Module level MM (Mastermodul / Master module)

Type of module Wahlpflicht / Elective

Teaching/Learning method Lecture, seminar

Previous knowledge

Examination Examination times Type of examination

Final exam of module exam during final lecture week 3 exams:
- 2 presentations (20% each; the main seminar is mandatory, one of the two options need to be taken in addition)
- 1 written exam or 1 oral exam (60%) Regular active participation is required for the module to be passed successfully.

Type of course Comment SWS Frequency Workload of compulsory attendance

Lecture 4 WiSe 56

Seminar 4 WiSe 56

Total module attendance time 112 h
bio663 - Ornithology in Practice

Module label: Ornithology in Practice
Module abbreviation: bio663
Credit points: 12.0 KP

Workload: 360 h
(2 weeks, 40h/week. Types of programme may differ slightly between the four different courses.)

Applicability of the module: Master's Programme Biology (Master) > Background Modules

Responsible persons:
- Liedvogel, Miriam (module responsibility)
- Bouwhuis, Sandra (Module counselling)
- Langemann, Ulrike (Module counselling)
- Vedder, Oscar Herman (Module counselling)
- Schmaljohann, Heiko (Module counselling)
- Liedvogel, Miriam (Prüfungsberechtigt)
- Bouwhuis, Sandra (Prüfungsberechtigt)
- Langemann, Ulrike (Prüfungsberechtigt)
- Vedder, Oscar Herman (Prüfungsberechtigt)
- Schmaljohann, Heiko (Prüfungsberechtigt)

Prerequisites

Skills to be acquired in this module

The aim

++ broad and in depths biological expertise
++ in depths knowledge of biological working methods
++ data analysis skills
+ interdisciplinary thinking
+ critical and analytical thinking
++ independent searching and knowledge of scientific literature
++ data presentation and discussion in German and English (written and spoken)
+ teamwork
+ project and time management
+ statistics and scientific programming

of the module is to consolidate various aspects of ornithology as well as to impart up to date methods applied in ornithological research.

Module contents

The module comprises four required elective courses (6 CP each), two of which have to be chosen.

Required elective course 1: Laboratory course and seminar “Ecology of Colonial Seabirds” (6 CP) The Institute of Avian Research safeguards a long-term individual-based study on common terns: colonially breeding, migratory, piscivorous seabirds. Students spend a week at the colony (located at the Banter See in Wilhelmshaven) to ask a scientific question (e.g. about foraging behaviour, coloniality or courtship behaviour) and collect data to answer it; then spend a week analysing the data statistically, writing a short report in Biology Letters format and presenting their results to their peers. Students receive one mark for the report and one for the presentation and the final mark for the course will be the average of these two marks.

Required elective course 2: Laboratory course and seminar “Communication in Birds” (6 CP). Original recordings from bird songs will be used to generate new data sets for the practical. From these recordings we will prepare spectrograms and analyze the waveforms and frequency spectra. Techniques and statistical method that allow to classify song types from individuals or from populations will be introduced and applied. For example, cluster analysis and discriminant analysis are statistical methods to assess the dissimilarity between “objects” or song type characteristics. The theoretical background for the practical is provided by the seminar using a standard text book on bird
Required elective course 3: Laboratory course and seminar “Japanese Quail” (6 CP). Observations and investigations of behaviour in relation to reproductive activity of male and female Japanese quail, at the Institute of Avian Research. Students will learn about theory regarding pace of life and exploration behaviour and develop predictions for inter-individual differences in exploration behaviour in relation to sex and reproductive activity. These predictions will be tested with standardized behavioural observations and measurements of food intake in the quail. The data will be analysed and discussed in the broader context of life-history theory.

Required elective course 4: Laboratory course and seminar “Scientific research in field ornithology, incl. identification of birds” (6 CP) This course has three teaching objectives. Firstly, to impart knowledge of the local bird community. This is conveyed through practical courses, work on bird specimens, and lectures. Secondly, learning and getting to know some standard methods of field ornithology, e.g. breeding survey, waterbird counts, radio telemetry, mist netting. Both teaching objectives form the basis for the third teaching objective. In this, the students independently conduct a scientific ornithological study. The data are analysed in the course under supervision. The results are summarised in a two-page scientific publication. At the end of the course, a kind of scientific conference takes place, in which all scientific projects are presented and discussed. The final grade is made up of the grades for the presentations and the scientific publication.

Recommended reading

Required elective course 1:

Required elective course 2:

Required elective course 3:

Required elective course 4:

Links
Language of instruction
English
Duration (semesters)
1 Semester
Module frequency
Module capacity 12 (number of students varies between the four required elective courses. for REC1 it is 8, for REC2 it is 9, for REC3 it is 4, for REC4 it is 12)
Module level MM (Mastermodul / Master module)
<table>
<thead>
<tr>
<th>Type of module</th>
<th>Wahlpflicht / Elective</th>
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<tbody>
<tr>
<td>Teaching/Learning method</td>
<td>Exercise, seminar</td>
</tr>
<tr>
<td>Previous knowledge</td>
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<tr>
<td>Examination</td>
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<tr>
<td>Examination times</td>
<td></td>
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<tr>
<td>Type of examination</td>
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<tr>
<td>Final exam of module</td>
<td>within the two weeks per required elective course</td>
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<tr>
<td>Type of examination</td>
<td>1 exam: 1 portfolio (2 presentations, 2 reports)</td>
</tr>
<tr>
<td>Type of course</td>
<td>Seminar und Übung</td>
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<tr>
<td>Frequency</td>
<td>SoSe oder WiSe</td>
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<td>Workload Präsenzzeit</td>
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bio675 - Molecular Ecology

Module label: Molecular Ecology
Module abbreviation: bio675
Credit points: 12.0 KP
Workload: 360 h

Applicability of the module:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Landscape Ecology (Master) > Basismodule

Responsible persons:
- Nolte, Arne (module responsibility)
- Gerlach, Gabriele (Module counselling)
- Nolte, Arne (Prüfungsberechtigt)
- Gerlach, Gabriele (Prüfungsberechtigt)
- Dennenmoser, Stefan (Prüfungsberechtigt)

Prerequisites:
- B.Sc. (Biologie, Umweltwissenschaften) M.Sc. (Biologie, Marine Umweltwissenschaften, Landschaftsökologie)

Skills to be acquired in this module:
The field of molecular ecology strives to identify relationships between species genotypes, phenotypes and ecological factors. It addresses questions about how organisms adapt and explains patterns of distribution and biodiversity. During the course, participants will get to know the biological background to design an experiment in the field of molecular ecology. We will discuss the state of the art according to literature. Participants will perform sampling and conduct steps of the analysis. The course will cover field methods (sampling) and lab methods (behavior experiments, genetic analyses, phenotypic analyses) as well as computer based analyses.

++ deepened biological expertise
++ deepened knowledge of biological working methods
++ data analysis skills
+ interdisciplinary thinking
+ critical and analytical thinking
+ independent searching and knowledge of scientific literature
++ ability to perform independent biological research
++ data presentation and discussion (E) (written and spoken)
+ statistics & scientific programming

Module contents:
Lecture: AN/GG - Molecular ecology background of specific study systems. The lectures will introduce a study system that will be analyzed during the course (study systems may vary from year to year). It is the goal of the lecture to provide students with background information to develop an experimental design of a field study during the practical. Excercise: AN/GG - Mixed course with laboratory and field exercises. Samples will be collected in the field. One goal of the course is to apply modern analyses to understand how organisms are distributed. Another aspect is the application of molecular markers to analyze behavioral experiments.

Recommended reading:
will be announced during the course

Links

Languages of instruction: German, English
Duration (semesters): 1 Semester
Module frequency: summer term
Module capacity: 15
Reference text:
associated with bio890 Current Topics of Biology (Seminar)

Module level: MM (Mastermodul / Master module)
Type of module: Wahlpflicht / Elective
Teaching/Learning method: Lecture, Exercise

Previous knowledge:
Reading English literature and presenting seminar topics in English. Basic knowledge of working in a gene laboratory and with a computer.

Examination:
Examination times
Type of examination

Final exam of module:
during the module
Presentations (50%), Portfolio (50%). Regular participation is a prerequisite to pass in the module.

Type of course:

<table>
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<tr>
<th>Type of course</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
<td>Lecture</td>
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<td>SoSe</td>
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<td></td>
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bio695 - Biochemical concepts in signal transduction

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<tr>
<td>Module abbreviation</td>
<td>bio695</td>
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<td>Workload</td>
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<td>Applicability of the module</td>
<td>- Master’s Programme Biology (Master) &gt; Background Modules</td>
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<tr>
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<td>- Master’s Programme Molecular Biomedicine (Master) &gt; Background Modules</td>
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<tr>
<td></td>
<td>- Master’s Programme Neuroscience (Master) &gt; Background Modules</td>
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<tr>
<td>Responsible persons</td>
<td>- Koch, Karl-Wilhelm (module responsibility)</td>
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<td>- Koch, Karl-Wilhelm (Prüfungsberechtigt)</td>
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<td>- Scholten, Alexander (Prüfungsberechtigt)</td>
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<td>- Scholten, Alexander (Module counselling)</td>
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<td>Skills to be acquired in this module</td>
<td>++ deepened knowledge of biological working methods</td>
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<tr>
<td></td>
<td>++ methods: protein expression and purification, functional assays, enzyme kinetics, spectroscopic techniques</td>
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<td>++ data analysis skills</td>
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<td></td>
<td>++ interdisciplinary thinking</td>
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<td>++ critical and analytical thinking</td>
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<td>++ independent searching and knowledge of scientific literature</td>
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<td>++ ability to perform independent biological research</td>
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<td></td>
<td>++ data presentation and discussion in German and English (written and spoken)</td>
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<td></td>
<td>++ teamwork</td>
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<td></td>
<td>++ project and time management</td>
</tr>
<tr>
<td></td>
<td>Mechanisms of biochemical signal transduction are imparted theoretically and experimentally</td>
</tr>
<tr>
<td>Recommended reading</td>
<td>Textbooks of cell biology and biochemistry. Current literature on topics of signal transduction (as announced in the preparatory meeting).</td>
</tr>
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<td>Links</td>
<td>English</td>
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<td>Duration (semesters)</td>
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<td>Teaching/Learning method</td>
<td>Lecture, seminar, exercise</td>
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<td>Examination</td>
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<td>Examination times</td>
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<td>Type of examination</td>
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<td>written examination (50%), protocols (50%)</td>
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<td>Prerequisite for passing the module is active participation: Presentation(s) in the seminar</td>
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### bio703 - Basic Concepts in Plant Sciences

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<th>Basic Concepts in Plant Sciences</th>
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<td>bio703</td>
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<td>Workload</td>
<td>360 h</td>
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<td>Applicability of the module</td>
<td>Master's Programme Biology (Master) &gt; Background Modules</td>
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<tr>
<td>Responsible persons</td>
<td>Zotz, Gerhard (module responsibility)</td>
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<td>Albach, Dirk Carl (Module counselling)</td>
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<td>von Hagen, Klaus Bernhard (Module counselling)</td>
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<td>Will, Maria (Prüfungsberechtigt)</td>
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<tr>
<td>Prerequisites</td>
<td>Communicating deeper knowledge in ecology, phylogeny, evolution and genetics of plants Communicating deeper theoretic concepts of ecology, evolution and genetics of plants.</td>
</tr>
<tr>
<td></td>
<td>++ deepened biological expertise</td>
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<td></td>
<td>+ deepened knowledge of biological working methods</td>
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<td></td>
<td>+ data analysis skills</td>
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<td>+ interdisciplinary thinking</td>
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<td>+ ability to perform independent biological research</td>
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<tr>
<td></td>
<td>++ data presentation and discussion in English (written and spoken)</td>
</tr>
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<td></td>
<td>+ teamwork</td>
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<td>++ ethics and professional behaviour</td>
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<td>Module contents</td>
<td>V: Biodiversity of plants (2 SWS) V: Resource acquisition and use by plants (1 SWS) V: Gene expression in plants (1 SWS) S: Phylogeny of plants (2 SWS) S: Interactions of plants with environmental parameters (2 SWS)</td>
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<td>Duration (semesters)</td>
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<tr>
<td>Reference text</td>
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<tr>
<td>Module level</td>
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<tr>
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<td>Teaching/Learning method</td>
<td>Lecture, seminar</td>
</tr>
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<td>Examination</td>
<td>Examination times</td>
</tr>
<tr>
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<td>Ecology, flora, genetics</td>
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<tr>
<td>Examination</td>
<td>Type of examination</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>1 Portfolio</td>
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<td>Comment</td>
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<td></td>
<td>Lecture</td>
</tr>
<tr>
<td></td>
<td>Seminar</td>
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<tr>
<td>Total module attendance time</td>
<td>112 h</td>
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</table>

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15 / 75
bio720 - Marine Biodiversity

Module label: Marine Biodiversity
Module abbreviation: bio720
Credit points: 15.0 KP
Workload: 450 h

Applicability of the module
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

Responsible persons
- Martinez Arbizu, Pedro Miguel (module responsibility)
- Wehrmann, Achim (Prüfungsberechtigt)
- Rossel, Sven (Prüfungsberechtigt)
- Gutt, Julian (Prüfungsberechtigt)
- Kröncke, Ingrid (Prüfungsberechtigt)

Prerequisites
- BSc (Biology)

Skills to be acquired in this module
++ deepened biological expertise
++ deepened knowledge of biological working methods
++ data analysis skills
++ interdisciplinary thinking
++ critical and analytical thinking
++ independent searching and knowledge of scientific literature
++ ability to perform independent biological research
++ data presentation and discussion (written and spoken) (E)
++ teamwork
+ ethics and professional behaviour
+ project and time management
++ statistics & scientific programming

Knowledge of fundamentals, topical subjects and methods in Marine Biology and Marine Geology. Studies and critical assessment of the scientific literature.

Module contents
L: (AW) General Marine Geology E: Biogenic sedimentation, Interaction benthos-sediment; (SS) Plankton of the oceans; (MH) unicellular plankton; (IK) benthos of the North-Sea; (PM) biodiversity in the deep sea and on seamounts; (JG) conceptions and hypotheses of marine biodiversity, biodiversity of marine vertebrates; (GG) animal migrations and dispersal behaviour. Methods and scientific work on research vessels. A lecture comprises the above-mentioned subjects and imparts marine biological theories, research results and methods. In the seminar, research is presented and discussed. In the laboratory course/exercises, subjects are treated in coordination with the contents of the lecture. With the aid of a computer, data are analysed and interpreted statistically.

Recommended reading
as announced in the lecture

Language of instruction: German
Duration (semesters): 1 Semester
Module frequency: winter term
Module capacity: unlimited
Module level: MM (Mastermodul / Master module)
Type of module: Wahlpflicht / Elective
Teaching/Learning method: Lecture, seminar, exercise

Previous knowledge

Examination Examination times Type of examination
Final exam of module Written examination (60 %), portfolio (20 %), short presentation (20%) Regular active participation is required for the module to be passed.

Type of course Comment SWS Frequency Workload of compulsory attendance
Lecture 3 WiSe 42
Exercises 9 WiSe 126
Seminar 1 WiSe 14

Total module attendance time: 182 h
### bio733 - Evolutionary Biology Population Genetics

<table>
<thead>
<tr>
<th>Module label</th>
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<tbody>
<tr>
<td>Module abbreviation</td>
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<tr>
<td>Credit points</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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<td>Master's Programme Biology (Master) &gt; Background Modules</td>
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<tr>
<td>Responsible persons</td>
<td>Gerlach, Gabriele (module responsibility)</td>
</tr>
<tr>
<td></td>
<td>Albach, Dirk Carl (Module counselling)</td>
</tr>
<tr>
<td></td>
<td>Khan, Gulzar (Module counselling)</td>
</tr>
<tr>
<td>Further responsible persons</td>
<td>Levent Khan</td>
</tr>
<tr>
<td>Responsible persons</td>
<td>Gerlach, Gabriele (Prüfungsberechtigt)</td>
</tr>
<tr>
<td></td>
<td>Albach, Dirk Carl (Prüfungsberechtigt)</td>
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<td>Skills to be acquired in this module</td>
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</tr>
<tr>
<td></td>
<td>++ deepened knowledge of biological working methods</td>
</tr>
<tr>
<td></td>
<td>++ data analysis skills</td>
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<td>++ critical and analytical thinking</td>
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<tr>
<td></td>
<td>++ independent searching and knowledge of scientific literature</td>
</tr>
<tr>
<td></td>
<td>++ data presentation and discussion (E) (written and spoken)</td>
</tr>
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<td></td>
<td>+ teamwork</td>
</tr>
<tr>
<td></td>
<td>++ statistics &amp; scientific programming</td>
</tr>
<tr>
<td>Module contents</td>
<td>Lecture conveys knowledge about the fields of population genetics, evolution and speciation. Important laboratory methods regarding DNA sequencing will be learned as well as basics and background information on the analysis of dispersal, distribution, genetic diversity of plant and animal species. Exercise: Data sets and methods will be analysed to determine distribution and genetic exchange between populations</td>
</tr>
<tr>
<td>Recommended reading</td>
<td>current papers in Evolutionary Biology, Futuyama D. Evolutionary Biology, Elsevier, Hartl &amp; Clark Principles of Population Genetics, Sinauer</td>
</tr>
<tr>
<td>Languages of instruction</td>
<td>German, English</td>
</tr>
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<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
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<tr>
<td>Reference text</td>
<td>associated with bio736 (Evolutionary Transcriptomics) (recommended)</td>
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<tr>
<td>Module level</td>
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<tr>
<td>Type of module</td>
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<tr>
<td>Teaching/Learning method</td>
<td></td>
</tr>
<tr>
<td>Previous knowledge</td>
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<tr>
<td>Examination</td>
<td>Examination times</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>portfolio (60%) presentation (40%)</td>
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<tr>
<td>Type of course</td>
<td>Comment</td>
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<td>Lecture</td>
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<td>Exercises</td>
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bio736 - Evolutionary Transcriptomics

Module label: Evolutionary Transcriptomics
Module abbreviation: bio736
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Master's Programme Biology (Master) > Background Modules

Responsible persons:
- Nolte, Arne (module responsibility)
- Dennenmoser, Stefan (Module counselling)
- Nolte, Arne (Prüfungsberechtigt)
- Dennenmoser, Stefan (Prüfungsberechtigt)

Prerequisites: none

Skills to be acquired in this module:
+ deepened biological expertise
++ deepened knowledge of biological working methods
++ data analysis skills;
++ critical and analytical thinking
+ independent searching and knowledge of scientific literature
++ data presentation and discussion in English (written and spoken)
++ statistics & scientific programming

Module contents:
Lecture: Gene expression represents the first step of the translation of genomic information into a phenotype. This phenotype is of broad interest in all disciplines of biology. Gene expression data can reveal how genetic changes at single genes manifest phenotypically and how gene expression is regulated. The same data can also explain differences in life history and adaptation to different environments. Different perspectives can be understood by studying mechanisms of gene regulation as well as broad scale transcriptomics analyses. Exercise: We will generate and analyze gene expression data during the course including wet lab and computational methods. Practicals include the analysis of single-gene expression data as well as RNAseq data representing complete transcriptomes.

Recommended reading

Links

Languages of instruction: German, English
Duration (semesters): 1 Semester
Module frequency: 12
Module capacity: 12
Reference text: associated with bio733: Evolutionary Biology Population Genetics (recommended)

Module level

Type of module

Teaching/Learning method

Previous knowledge

Examination

Final exam of module

Course: Lecture
Comment: 1
SWS: 1
Frequency: WiSe
Workload of compulsory attendance: 14

Course: Exercises
Comment: 3
SWS: 3
Frequency: WiSe
Workload of compulsory attendance: 42

Total module attendance time: 56 h
# Current Methods in Plant Sciences - Ecology, Phylogeny and Molecular Biology

<table>
<thead>
<tr>
<th>Module label</th>
<th>Current Methods in Plant Sciences - Ecology, Phylogeny and Molecular Biology</th>
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</thead>
<tbody>
<tr>
<td>Module abbreviation</td>
<td>bio765</td>
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<tr>
<td>Credit points</td>
<td>12.0 KP</td>
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<tr>
<td>Workload</td>
<td>360 h</td>
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</table>

## Applicability of the module
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Landscape Ecology (Master) > Basismodule

## Responsible persons
- Albach, Dirk Carl (module responsibility)
- Zotz, Gerhard (Module counselling)
- Will, Maria (Module counselling)
- Khan, Guzar (Module counselling)
- von Hagen, Klaus Bernhard (Module counselling)
- Will, Maria (Prüfungsberechtigt)
- Albach, Dirk Carl (Prüfungsberechtigt)
- Zotz, Gerhard (Prüfungsberechtigt)
- Khan, Guzar (Prüfungsberechtigt)
- von Hagen, Klaus Bernhard (Prüfungsberechtigt)

## Prerequisites
- Acquaintance and practicing ecological, phylogenetic and molecular methods
- Communication of scale- and method-overarching thinking and project planning
- Knowledge of current methods and questions in plant science
- Capacity for teamwork, project- and time management
- Deepened biological expertise
- Deepened knowledge of biological working methods
- Data analysis skills
- Interdisciplinary thinking
- Critical and analytical thinking
- Independent searching and knowledge of scientific literature
- Ability to perform independent biological research
- Data presentation and discussion (written and spoken)
- Teamwork
- Statistics & scientific programming

## Module contents
- Ü: Current Methods in Plant Science (8 SWS)

## Recommended reading
- associated with bio703 (Basic Concepts in Plant Sciences) (recommended)

## Languages of instruction
- German, English

## Duration (semesters)
- 1 Semester

## Module capacity
- 12

## Reference text
- associated with bio703 (Basic Concepts in Plant Sciences) (recommended)

## Module level

## Type of module

## Teaching/Learning method

## Previous knowledge

## Examination

## Final exam of module
- Type of course: Exercises
- Type of examination: Portfolio

## Type of course
- Exercises

## SWS
- 8

## Frequency
- WiSe

## Workload Präsenzzeit
- 112 h
**bio770 - Field Methods in Organismal Biology**

<table>
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<tr>
<td>Module abbreviation</td>
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<tr>
<td>Credit points</td>
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<td>Workload</td>
<td>450 h</td>
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</table>

**Applicability of the module**

- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Landscape Ecology (Master) > Bassimodule

**Responsible persons**

- Zotz, Gerhard (module responsibility)
- Gerlach, Gabriele (Module counselling)
- Albach, Dirk Carl (Module counselling)
- von Hagen, Klaus Bernhard (Module counselling)
- Nolte, Arne (Module counselling)
- Kotz, Gerhard (Prüfungsberechtigt)
- Gerlach, Gabriele (Prüfungsberechtigt)
- Albach, Dirk Carl (Prüfungsberechtigt)
- Will, Maria (Prüfungsberechtigt)
- von Hagen, Klaus Bernhard (Prüfungsberechtigt)
- Nolte, Arne (Prüfungsberechtigt)
- Khan, Guizar (Prüfungsberechtigt)

**Prerequisites**

++ deepened biological expertise
++ deepened knowledge of biological working methods
++ data analysis skills
+ interdisciplinary thinking
++ critical and analytical thinking
++ independent searching and knowledge of scientific literature
++ ability to perform independent biological research
+ data presentation and discussion (E) (written and spoken)
++ project and time management
++ statistics & scientific programming

The module aims at enabling students to apply theoretical knowledge to practical, hypothesis-based field studies within the scope of a seminar. The data derived from the individual projects performed are then to be documented and discussed in the form of a written laboratory course report oriented by a scientific publication and to be written in English. Several teachers cooperate to enable interdisciplinary approaches (e.g. botanical-zoological approaches).

**Module contents**

S: Biogeographic and ecological classification and characterization of a biome (e.g. Mediterranean region, moist tropics, boreal zone), independent identification and treatment of scientific questions, presentation of scientific results in a "mini symposium" subsequent to the field studies. E: Planning and performing a field study project, data analysis, written report in the form of a scientific publication

**Recommended reading**

Varies with topic and field locality

**Links**

www.uni-oldenburg.de/fun_eco/

**Languages of instruction**

German, English

**Duration (semesters)**

1 Semester

**Module frequency**

jährlich

**Module capacity**

21

**Module level**

je nach Studiengang Pflicht oder Wahlpflicht

**Teaching/Learning method**

**Previous knowledge**

**Examination**

<table>
<thead>
<tr>
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<th>Type of examination</th>
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<td>2 Presentations (30 %) Laboratory course report on project work (70 %)</td>
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**Final exam of module**

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<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
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**Total module attendance time** 168 h
# bio773 - Sequence based biomonitoring

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<tbody>
<tr>
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<td>Applicability of the module</td>
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<tr>
<td>Responsible persons</td>
<td>Nolte, Arne (module responsibility)</td>
</tr>
<tr>
<td></td>
<td>Dennenmoser, Stefan (Module counselling)</td>
</tr>
<tr>
<td></td>
<td>Nolte, Arne (Prüfungsberechtigt)</td>
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<td>Dennenmoser, Stefan (Prüfungsberechtigt)</td>
</tr>
<tr>
<td></td>
<td>Martinez Arbizu, Pedro Miguel (Prüfungsberechtigt)</td>
</tr>
<tr>
<td></td>
<td>Albach, Dirk Carl (Prüfungsberechtigt)</td>
</tr>
<tr>
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<td>Khan, Gulzar (Prüfungsberechtigt)</td>
</tr>
<tr>
<td>Prerequisites</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>+ deepened biological expertise</td>
</tr>
<tr>
<td></td>
<td>++ deepened knowledge of biological working methods</td>
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<td></td>
<td>++ data analysis skills</td>
</tr>
<tr>
<td></td>
<td>++ critical and analytical thinking</td>
</tr>
<tr>
<td></td>
<td>+ independent searching and knowledge of scientific literature</td>
</tr>
<tr>
<td></td>
<td>++ data presentation and discussion in English (written and spoken)</td>
</tr>
<tr>
<td></td>
<td>++ statistics and scientific computing</td>
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<tr>
<td>Module contents</td>
<td>Content of the module:</td>
</tr>
<tr>
<td></td>
<td>Lecture: The identification of organisms based on DNA sequences is well established and databased dedicated for this purpose are growing through 'barcoding of life' initiatives. Such information can be used to assign sequences extracted from environmental samples to individual species. This can be used to obtain species inventories and to study communities. While these methods are already used in fundamental research, they are only slowly adopted by fields such as conservation and ecosystem monitoring. The lecture covers concepts, methods, promises and problems of sequence based biomonitoring.</td>
</tr>
<tr>
<td></td>
<td>Seminar: participants present topics relevant to the module.</td>
</tr>
<tr>
<td></td>
<td>Exercise: We will generate and analyse sequence data data from environmental samples to generate species inventories for terrestrial and aquatic ecosystems. For this purpose we will extract eDNA from samples and apply next generation sequencing. The read data will be jointly analysed on the university hpc cluster. The participants will study methods and concepts associated with the analyses and present them in short presentations. The key aspect in the practical cours is to assign sequences to species and to discuss the applicability of the methods in fundamental research and in applied, management oriented research.</td>
</tr>
<tr>
<td>Recommended reading</td>
<td></td>
</tr>
<tr>
<td>Links</td>
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<tr>
<td>Language of instruction</td>
<td>English</td>
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<td>Duration (semesters)</td>
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<td>Module frequency</td>
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<td>Module capacity</td>
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<td>Reference text</td>
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<td>recommended :</td>
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<td></td>
<td>Evolutionary Biology Gerlach/Albach.</td>
</tr>
<tr>
<td></td>
<td>Molecular Ecology: Nolte/Gerlach</td>
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<tr>
<td>Module level</td>
<td>22 / 75</td>
</tr>
</tbody>
</table>
### Type of module

**Teaching/Learning method**

**Previous knowledge**

Useful previous knowledge:
- Evolutionary Biology
- Reading of scientific literature and presentation of seminar topics in English
- Basic knowledge about molecular laboratory work and computer skills
- Experience with species inventory in the field

**Examination**

<table>
<thead>
<tr>
<th>Examination times</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Final exam of module</strong></td>
<td>2 parts: Präsentation (50%) und Portfolio (50%)</td>
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</table>

<table>
<thead>
<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>WiSe</td>
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<tr>
<td>Seminar</td>
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<td>WiSe</td>
<td>14</td>
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<td>Exercises</td>
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<td>WiSe</td>
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</table>

**Total module attendance time**

112 h
Module label: Biodiversity of Littoral Communities

Module abbreviation: bio780

Credit points: 15.0 KP

Workload: 450 h

Applicability of the module:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

Responsible persons:
- Martinez Arbizu, Pedro Miguel (module responsibility)
- Martinez Arbizu, Pedro Miguel (Prüfungsberechtigt)

Prerequisites:
- Safe apnoediving with aptitude test and medical fitness certificate

Skills to be acquired in this module:
+ deepened knowledge of biological working methods
+ ability to perform independent biological research
++ teamwork
+ ethics and professional behaviour
+ project and time management

By actively participating in this module students acquire qualifications in the following fields: Biological oceanography, marine biology and marine ecology:
- Geological formation history of the Mediterranean Sea and Atlantic Ocean, respectively, or the Red Sea and adjacent seas
- Oceanography and hydrology
- Development of the faunal and floral composition of the Atlantic Ocean, the Mediterranean Sea and the Mediterranean region or the Red Sea (biogeography)
- Commercial utilization of the seas and its impacts
- Biotopes and biotic communities
- Evolution, systematics, morphology, modes of life, and ecology of selected animal groups
- Applying theoretical knowledge to real-world organisms/systems
- Improved and specialized knowledge of species
- Adaptation of life cycles
- Interaction between organisms and environment
- Dynamics of reef-building and reef-degrading processes
- Threat to coral reefs/protection of marine environments

Methods:
- Formulation and definition of scientific approaches and selection of methods
- Observation and investigation of organisms and their habitats (snorkelling/diving)
- Documentation of small research projects in groups in the style of a scientific publication
- Editorial work to prepare a module report
- Popular presentation of results to be published by the media and to be presented at the University

Further skills:
- Social engagement in groups/teamwork in projects
- Independent scientific work in groups
- Improvement of scientific discussion culture
- Consciousness of the threat to coral reefs

Culture:
- History, culture, politics, and religion
- Physiological aspects of apnoediving
- Measures in case of accidents (also caused by "poisonous" organisms)

Module contents:
Biodiversity of littoral biotic communities – topographical field research

Recommended reading:
- GRÜTER, W., 2001: Leben im Meer - Vielfalt und Zusammenhänge. Dr. Friedrich Pfeil Verlag, München. % Should be read prior to a marine biological excursion!
- HEMPEL, G., HEMPEL, I. & S. SCHIEL (HRSG.), 2006: Faszination Meeresforschung – Ein biologisches Lesebuch. Hauschild Verlag. % This textbook is information and fun for all readers interested in marine life as well as in the protection of marine environments.

Literature study:
Web of science: http://www.bis.uni-oldenburg.de – Data banks (DBIS) – Biology – TOP data banks, e.g. ASFA, Science Citation Index, Zoological Record
http://www.biodiversitylibrary.org/bibliography/14107
http://scholar.google.de/externhttp://www.vifabio.de
Open access journals: externhttp://www.doaj.org/ – externhttp://www.plosone.org

Links
<table>
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<th>Language of instruction</th>
<th>German</th>
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<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
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<td>Module frequency</td>
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### Type of module

- Type of module: je nach Studiengang Pflicht oder Wahlpflicht

### Teaching/Learning method

<table>
<thead>
<tr>
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<th>Examination times</th>
<th>Type of examination</th>
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<tbody>
<tr>
<td>Final exam of module</td>
<td>during the lectures</td>
<td>2 short presentations (30 %), 1 internship report (70 %) (project report in the style of a scientific publication) PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.</td>
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</table>

<table>
<thead>
<tr>
<th>Type of course</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
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<tr>
<td>Seminar (Pflichtveranstaltung für Erstsemester OHNE bisherige Belehrung)</td>
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### Total module attendance time

- Total module attendance time: 168 h
### bio845 - Introduction to Development and Evolution

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<tr>
<th>Module label</th>
<th>Introduction to Development and Evolution</th>
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<tbody>
<tr>
<td>Module abbreviation</td>
<td>bio845</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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**Applicability of the module**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

**Responsible persons**
- Sienknecht, Ulrike (module responsibility)
- Sienknecht, Ulrike (Module counselling)
- Sienknecht, Ulrike (Prüfungsberechtigt)
- Claußen, Maike (Prüfungsberechtigt)

**Prerequisites**

**Skills to be acquired in this module**

Upon successful completion of this course, students
- know the fundamental problems organisms share in development
- know the common basic steps of ontogenesis after comparing the life cycles of different species (both vertebrates and invertebrates)
- know the fundamentals of the genetic control of cell-fate specification, morphogenesis, and organogenesis
- know the principles of gene regulatory networks in development and are able to explain examples
- are able to explain and discuss mechanisms of development across taxonomic groups and questions about the evolution of developmental mechanisms
- have in-depth knowledge of the development of animal nervous systems, including cellular and net-work properties

Skills:
- ++ deepened biological expertise
- + deepened knowledge of biological working methods
- ++ interdisciplinary thinking
- ++ critical and analytical thinking
- + independent searching and knowledge of scientific literature
- + ability to perform independent biological research
- + teamwork

**Module contents**

Lectures on the fundamentals and concepts of developmental biology, including evolutionary aspects. Parallel seminars matching the topics of the lectures and emphasizing discussion. Lecture topics:
- Introduction to Developmental Biology
- Cell-Cell Communication
- Differential Gene Expression (I and II)
- Early Development of Vertebrates, Gastrulation
- Neurulation
- Brain Development
- Axonal Growth, Target Selection, Synaptogenesis and Refinement
- Neural Crest
- Mesoderm Development
- Morphogenesis
- Developmental Mechanisms of Evolutionary Change
- Model Organisms in Developmental Biology
- Transgenic Mice
- Medical Implications of Developmental Biology

Recommended reading

Literature:

**textbook**: Gilbert S.F.: Developmental Biology, Macmillan Publishers Ltd, 11th edition 2016 (current edition); and current literature on course topics

Links

Language of instruction: English

Duration (semesters): 1 Semester

Module frequency

Module capacity: 20 (selection criteria: sequence of registration)

Reference text: associated with bio846 (neu120) (Lab Exercises in Development and Evolution)

Module level: MM (Mastermodul / Master module)

Type of module: Wahlpflicht / Elective

Teaching/Learning method

Previous knowledge: organismic biology, developmental biology, evolutionary biology, neurobiology, genetics, molecular biology

Examination

Examination times: same winter term

Type of examination: oral exam of 30 minutes (or written exam)

Final exam of module

Type of course

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<th>Frequency</th>
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Total module attendance time: 90 h
bio846 - Lab Exercises in Development and Evolution

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<tr>
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<td>Credit points</td>
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<td>Workload</td>
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</table>
| Applicability of the module | • Master's Programme Biology (Master) > Background Modules
  • Master's Programme Biology (Master) > Background Modules
  • Master's Programme Neuroscience (Master) > Background Modules |
| Responsible persons | • Sienknecht, Ulrike (module responsibility)
  • Sienknecht, Ulrike (Module counselling)
  • Sienknecht, Ulrike (Prüfungsberechtigt)
  • Claußen, Maike (Prüfungsberechtigt)
  • Ebbers, Lena (Prüfungsberechtigt) |
| Prerequisites | mandatory prerequisite is the module bio845 (neu110) (Introduction to Development and Evolution) |

Skills to be acquired in this module

Upon successful completion of this course, students have skills in methods of developmental biology:

• are capable of performing live embryo husbandry

• are able to carry out in-ovo stainings

• are familiar with the use of embryonic stage discrimination standards for model organisms

• document the observed embryonic stages by drawings with anatomical labelling

• are familiar with tissue preparation (including cryosectioning), the use of different molecular markers, and immunohistological staining methods

• microscopy, data analysis, and photographic data documentation

• know the standards of proper documentation of research data and the universal format of a lab notebook

• know how to carry out formal laboratory reports (and the structure of a scientific paper)

• have basic knowledge in the field of auditory system development

• have basic knowledge of the organisation of the auditory system across vertebrate groups

• have basic knowledge of the development of the middle and inner ear, as well as selected auditory brain centres

are able to summarize current hypotheses about the evolution of the auditory system in vertebrates skills:

++ deepened biological expertise

++ deepened knowledge of biological working methods

++ data analysis skills

++ critical and analytical thinking

+ independent searching and knowledge of scientific literature

++ ability to perform independent biological research

+ data presentation and discussion (written and spoken)

+ teamwork

+ ethics and professional behaviour

+ project and time management
Module contents

Lab exercises in developmental biology of auditory research model organisms, such as chicken and mouse embryos. Practical introduction to methods, such as in-ovo live observation; developmental stage discrimination and description, tissue preparation for histology, sectioning, staining, and microscopy, including data analyses. Seminars in the field of auditory system development and methods based on current literature

Recommended reading


Links

Language of instruction English
Duration (semesters) 1 Semester
Module frequency
Module capacity 6 (selection criteria: advance of studies in MA program)
Reference text Associated with bio845 (neu110) (Introduction to Development and Evolution)
Module level MM (Mastermodul / Master module)
Type of module Wahlpflicht / Elective
Teaching/Learning method

Previous knowledge
organismic biology, experience with lab work

Examination Examination times Type of examination
Final exam of module same winter term 1 report

Type of course Exercises

SWS 6
Frequency WiSe

Workload Präsenzzeit 84 h
**bio860 - Comparative Developmental Biology**

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<td>Master's Programme Biology (Master) &gt; Background Modules</td>
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<td>Responsible persons</td>
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<td></td>
<td>Sienknecht, Ulrike (module responsibility)</td>
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<td>Sienknecht, Ulrike (Prüfungsberechtigt)</td>
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<td>N., N. (Module counselling)</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>++ deepened biological knowledge</td>
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<td></td>
<td>++ deepened knowledge of techniques in biology</td>
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<tr>
<td></td>
<td>++ knowledge in data analysis and presentation</td>
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<td></td>
<td>+ cross-disciplinary knowledge and thinking</td>
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<td>++ critical and analytical thinking</td>
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<td>+ independent searching and knowledge of scientific literature</td>
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<td>++ ability to perform independent biological research</td>
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<td></td>
<td>++ data presentation and discussion (E) (written and spoken)</td>
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<td></td>
<td>+ team work</td>
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<td>+ ethics and professional behaviour</td>
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<td>++ project and time management</td>
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<tr>
<td>Module contents</td>
<td>Lectures and Lab exercises in topics of evolutionary developmental biology, i.e. comparative developmental biology, such as the development of sensory systems in different species.</td>
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<td>Examination times</td>
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<td>Type of examination</td>
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<td>Final exam of module</td>
<td>same summer term</td>
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<tr>
<td>Type of course</td>
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<td>SoSe</td>
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<td>SoSe</td>
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**Module level**

**Type of module**

je nach Studiengang Pflicht oder Wahlpflicht

**Teaching/Learning method**

**Previous knowledge**

**Examination**

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**Type of course**

**Comment**

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<td>3</td>
<td>SoSe</td>
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neu141 - Visual Neuroscience - Physiology and Anatomy

Module label | Visual Neuroscience - Physiology and Anatomy
Module abbreviation | neu141
Credit points | 12.0 KP

Workload | 360 h
3 SWS Lecture (VO)
Total workload 90 h: 30h contact / 60h background literature reading and preparation for sh
1 SWS Seminar (SE)
Total workload 30h: 10h contact / 20h literature reading and preparation of result presentation
8 SWS Supervised exercise (UE)
Total workload 240h: 200h contact / 40h results analysis, writing of short reports for portfolio

Applicability of the module
- Master’s Programme Biology (Master) > Background Modules
- Master’s Programme Biology (Master) > Background Modules
- Master’s Programme Molecular Biomedicine (Master) > Background Modules
- Master’s Programme Neuroscience (Master) > Background Modules

Responsible persons
- Greschner, Martin (module responsibility)
- Greschner, Martin (Prüfungsberechtigt)
- Ahlers, Malte (Prüfungsberechtigt)
- Dedek, Karin (Prüfungsberechtigt)
- Dömer, Patrick (Prüfungsberechtigt)

Prerequisites
Basic knowledge of neurobiology

Skills to be acquired in this module
++ Neurosci. knowlg.
++ Expt. Methods
+ Independent research
++ Scient. Literature
+ Social skills
+ Maths/Stats/Progr.
++ Data present./disc.
+ Scientific English
+ Ethics

Upon successful completion of this course, students
- have basic knowledge of electrophysiological techniques used in neuroscience research
- have acquired first practical skills in some electrophysiological techniques
- have acquired basic skills in data analysis
- have knowledge on retinal physiology and anatomy of the visual system
- have basic knowledge of brain structures and their function
- have profound knowledge of the architecture and circuits of the vertebrate retina
- have acquired basic skills in histological techniques (tissue fixation, embedding, sectioning, staining procedures, immunohistochemistry)
- have acquired fundamental skills in microscopy (differential interference contrast microscopy, phase-contrast microscopy, confocal microscopy)

Module contents
The background module Neurophysiology consists of two weeks of theoretical introduction and two weeks of hands-on lab exercises in patch or extracellular recordings and two weeks of hands-on lab exercises in anatomy.

The seminars cover the following topics:
- Visual system
- Introduction to electrophysiological methods
- Introduction into methods used in neuranatomy and neurochemistry
- Introduction into microscopy and image analysis
- Presentation and discussion of results relating to the literature

Recommended reading
Course scripts and mandatory scientific literature discussed in the seminar will be available in Stud.IP.
Background and seminar literature will be available in Stud.IP.

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<th>Language of instruction</th>
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<td>Module frequency</td>
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<td>annually, summer term, first half (full time)</td>
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<td>12 - with Visual Neuroscience: Anatomy (Shared course components with (cannot be credited twice): neu151 BM Visual Neuroscience: Anatomy)</td>
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| Module level                  |                         |         |
| Type of module                |                         |         |
| Teaching/Learning method      |                         |         |
| Previous knowledge            |                         |         |

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In addition, mandatory but ungraded: seminar presentation

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<td>Seminar</td>
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<td>SoSe oder WiSe</td>
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<td>SoSe oder WiSe</td>
<td>28</td>
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| Total module attendance time | 84 h |
neu150 - Visual Neuroscience - Anatomy

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<td>• Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</td>
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<td></td>
<td>• Master's Programme Neuroscience (Master) &gt; Background Modules</td>
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<tr>
<td>Responsible persons</td>
<td>• Janssen-Bienhold, Ulrike (module responsibility)</td>
</tr>
<tr>
<td></td>
<td>• Dedek, Karin (Module counselling)</td>
</tr>
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<td></td>
<td>• Janssen-Bienhold, Ulrike (Prüfungsberechtigt)</td>
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<tr>
<td></td>
<td>• Dedek, Karin (Prüfungsberechtigt)</td>
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<td></td>
<td>• Ahlers, Malte (Prüfungsberechtigt)</td>
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<td>Prerequisites</td>
<td>attendance in pre-meeting</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>Neurosci. knowlg. Expt. methods Independent research + Scient. literature + Social skills</td>
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<td></td>
<td>Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics</td>
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<tr>
<td></td>
<td>Theory: Improved theoretical and methodological knowledge in neurobiology. Discussion of scientific work and presentation of own results. Practice: Performing neuroanatomical experiments. Gaining modern methodological skills.</td>
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<tr>
<td>Module contents</td>
<td>Lecture: 14 h Introduction to current neurobiological approaches and results. Seminar: 14 h Discussion of background literature and results of own experiments. Lab course: 3 weeks, each 24 h neuroanatomical experiments in small groups on vertebrate retina and brain.</td>
</tr>
<tr>
<td>Recommended reading</td>
<td>Background and seminar literature will be available in Stud.IP</td>
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<td>Links</td>
<td>English</td>
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<td>Reference text</td>
<td>Course in the first half of the semester Regular active participation and presentation(s) within the scope of the seminar are required to pass the module</td>
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Module level

Type of module

Teaching/Learning method

Previous knowledge

<table>
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<tr>
<th>Examination</th>
<th>Examination times</th>
<th>Type of examination</th>
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<tbody>
<tr>
<td>Final exam of module</td>
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<td>Portfolio (75 %), report (25%)</td>
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<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>Seminar</td>
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<td>SoSe</td>
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<td>Practical training</td>
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</table>

Total module attendance time 70 h
neu210 - Neurosensory Science and Behaviour

Module label Neurosensory Science and Behaviour

Module abbreviation neu210

Credit points 9.0 KP

Workload 270 h
- 4 SWS Lecture (VO) "Neuroethology" and "Behavioural ecology"
- Total workload 180h: 56h contact/ 60h background reading/ 64h exam preparation
- 2 SWS Seminar (SE) "Current issues of ethology"
- Total workload 90h: 28h contact/ 30h literature reading/ 32h preparation of presentation

Applicability of the module
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Responsible persons
- Langemann, Ulrike (module responsibility)
- Mouritsen, Henrik (Module counselling)
- Klump, Georg Martin (Prüfungsberechtigt)
- Albert, Jörg (Prüfungsberechtigt)
- Clemens, Jan (Prüfungsberechtigt)

Prerequisites
- Fundamentals of Neurobiology, Behavioural Biology, Evolution, Ecology

Skills to be acquired in this module
- ++ Neurosci. knowlg. + Expt. methods + Independent research + Scient. literature + Social skills
- ++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics

Upon successful completion of this course, students
- know the fundamentals of behavioural ecology and neuroethology
- are able to present and critically assess scientific data and approaches

Module contents
The lecture "Neuroethology" provides an introduction to the mechanisms underlying the behaviour of animals. Subjects are, e.g., the mechanisms of perception, control of movement patterns, mechanisms of learning, orientation and navigation.

The lecture "Behavioural ecology" provides an introduction to topics such as predator-prey interactions, optimal food utilization, spatial and temporal distribution of animals, social relations and group formation, mating systems and reproductive strategies, sexual selection, investment of parents in offspring, and communication.

In the seminar "Current issues of Ethology", current original literature relating to behavioural biology is reported and discussed.

Recommended reading

Links

Recommended reading

Language of instruction English

Duration (semesters) 1 Semester

Module frequency jährlich

Module capacity 30
- Recommended in combination with: neu220 BM "Neurocognition and Psychopharmacology"
- Shared course components with (cannot be credited twice): bio610 (5.02.611 "Neuroethologie", 5.02.612 "Verhaltensökologie", 5.02.613 "Aktuelle Themen der Ethologie"

Reference text
Course in the second half of the semester
Regular active participation is required to pass the module.

Module level
### Type of module

### Teaching/Learning method

#### Previous knowledge

<table>
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<tr>
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<th>Examination times</th>
<th>Type of examination</th>
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<td>Final exam of module</td>
<td>as agreed, usually in the break after the winter term</td>
<td>80% written exam (content of the two lecture series), 20% presentation(s)</td>
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#### Type of course

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**Total module attendance time**: 84 h
## neu220 - Neurocognition and Psychopharmacology

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<th>Module label</th>
<th>Neurocognition and Psychopharmacology</th>
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<tr>
<td>Module abbreviation</td>
<td>neu220</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
<tr>
<td></td>
<td>(3 SWS Lecture (VO) &quot;Introd. to Cognitive Neuroscience&quot; and &quot;Psychopharmacol.&quot; Total workload 135h: 45h contact/ 45 background reading/ 45h exam preparation 1 SWS Supervised exercise (UE) Total workload 45h: 14h contact/ 31h paper reading)</td>
</tr>
</tbody>
</table>

### Applicability of the module
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

### Responsible persons
- Thiel, Christiane Margarete (module responsibility)
- Thiel, Christiane Margarete (Module counselling)
- Thiel, Christiane Margarete (Prüfungsberechtigt)
- Gießing, Carsten (Prüfungsberechtigt)

### Prerequisites
- ++ Neurosci. knowlg. + Expt. methods Independent research + Scient. literature + Social skills
- ++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics

Upon successful completion of this course, students
- know the fundamentals of neurotransmission
- know the basic neural mechanisms underlying attention, learning, emotion, language and executive functions
- understand the relationship between disturbances in neurotransmitter systems, cognitive functions and psychiatric disease
- know the principles of drug treatment for psychiatric disorders
- have in-depth knowledge in selected areas of these topics
- are able to understand, explain and critically assess neuropsychiatric approaches in animals and humans
- are able to understand and critically assess published work in the area of cognitive neuroscience

### Module contents
The lecture "Introduction to Cognitive Neuroscience" gives a short introduction into neuroanatomy and cognitive neuroscience methods and then covers different cognitive functions.

**Lecture topics:**
- History of cognitive neuroscience
- Methods of cognitive neuroscience
- Attention
- Learning
- Emotion
- Language
- Executive functions.

The supervised exercises either deepen knowledge by exercises or discussions of recent papers’ talks on the respective topic covered during that week.

The lecture "Psychopharmacology" illustrates the connection between neurotransmitters and behaviour and its links to psychiatric disease. The lecture contains several interactive parts to consolidate and critically evaluate the acquired knowledge.

**Lecture topics:**
- Introduction to Terms and Definitions in Drug Research
- Dopaminergic and Noradrenergic System
- Cholinergic and Serotonergic System
- GABAergic and Glutamatergic System
- Addiction
- Depression
- Schizophrenia
- Anxiety
- Alzheimer's Disease

### Recommended reading
Press

Links

**Language of instruction**  
English

**Duration (semesters)**  
1 Semester

**Module frequency**  
jährlich

**Module capacity**  
30  
Recommended in combination with neu210 "Neurosensory Science and Behaviour", neu300 "Functional MRI data analysis" Shared course components with (cannot be credited twice): bio610 and psy181 (5.02.614 "Introduction to Cognitive Neuroscience", 5.02.615 "Psychopharmacology")

**Reference text**  
Course in the second half of the semester  
Regular active participation is required to pass the module.

**Module level**

**Type of module**

**Teaching/Learning method**

**Previous knowledge**

**Examination**  
Examination times  
Type of examination

**Final exam of module**  
as agreed, usually in the break after the winter term  
100% written exam (content of the lectures)

**Type of course**  
Comment  
SWS  
Frequency  
Workload of compulsory attendance

<table>
<thead>
<tr>
<th>Type of course</th>
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<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
<td>Lecture</td>
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<tr>
<td>Exercises</td>
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<td>1</td>
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<td>14</td>
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</table>

**Total module attendance time**  
56 h
neu310 - Psychophysics of Hearing

Module label: Psychophysics of Hearing
Module abbreviation: neu310
Credit points: 12.0 KP
Workload: 360 h
(W 5 SWS Practical (PR) “Experiments in Hearing” Total workload 225h: 70h contact / 110h experimental work / 45h exam preparation 1 SWS Supervised exercise (UE) “Fundamentals in psychoacoustic data analysis” Total workload 45h: 15h contact / 30h practising data analysis (incl. SPSS) 2 SWS Seminar (SE) “Hearing” Total workload 90h: 30h contact / 60h background reading)

Applicability of the module
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Responsible persons
- Klump, Georg Martin (module responsibility)
- Klump, Georg Martin (Prüfungsberechtigt)
- Langemann, Ulrike (Prüfungsberechtigt)
- Beutelmann, Rainer (Prüfungsberechtigt)

Prerequisites
- Skills to be acquired in this module
  + Neurosci. knowlg.
  ++ Expt. Methods
  + Social skills
  ++ Maths/Stats/Progr.
  + Data present./disc.
  + Scientific English

Students will learn the basics about performing a psychoacoustic experiment. Based on an experiment in which they study their own hearing, they will learn how to conduct a behavioural study in hearing and analyze the data. In addition, they will be be provided with an overview of the mechanisms of auditory perception.

Module contents
The modul comprises (i) a seminar “Hearing” [2 SWS] (ii) an exercise “Fundamentals in psychoacoustic data analysis” [1 SWS], and a (iii) practical course [7 SWS] including aspects of planning and conducting psychoacoustic experiments.

Recommended reading
Plack, Christopher J. (2005) The sense of hearing. Mahwah, NJ [u.a.] : Erlbaum (sufficient number of copies available in the university library)

Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: annually, summer term, second half
Module capacity: 6 (in total with bio640)
Module level: ---
Type of module: je nach Studiengang Pflicht oder Wahlpflicht
Teaching/Learning method: ---

Previous knowledge
Examination
Examination times
Type of examination
Final exam of module
end of summer term
70% report or oral exam, 30% presentation In addition, mandatory but ungraded: regular active participation

Type of course
Comment
SWS
Frequency
Workload of compulsory attendance
Exercises
1
SoSe
14
Seminar
2
SoSe
28
Practical training
5
SoSe
70
Lecture
SoSe
0
Total module attendance time: 112 h
# neu340 - Invertebrate Neuroscience - Neurophysiology

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<tr>
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<th>Invertebrate Neuroscience - Neurophysiology</th>
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<td>Credit points</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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<tr>
<td>2 SWS Seminar (SE)</td>
<td>Total workload 72h: 28h contact / 44h background literature reading, preparation for short tests, portfolio assignments and results presentation</td>
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<tr>
<td>3 SWS Supervised exercise (UE)</td>
<td>Total workload 108h: 42h contact / 66h data analysis and preparation of portfolio assignments</td>
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</table>

## Applicability of the module
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

## Responsible persons
- Kretzberg, Jutta (module responsibility)
- Kretzberg, Jutta (Prüfungsberechtigt)
- Albert, Jörg (Prüfungsberechtigt)

## Prerequisites
- attendance in pre-meeting

## Skills to be acquired in this module
- ++ Neurosci. knowlg.
- ++ Expt. Methods
- + Scient. Literature
- + Social skills
- + Maths/Stats/Progr.
- + Independent Research
- + Data present./disc.
- + Scientific English
- + Ethics

Upon successful completion of this course, students
- have knowledge on invertebrate neuronal systems in comparison to vertebrate systems
- have discussed an overview of experimental and theoretical methods of invertebrate neuroscience
- have acquired first practical skills in intracellular recordings from invertebrate neurons
- have acquired basic skills in data analysis
- have acquired an intuitive understanding of membrane potential and action potential generation based on computer simulations

## Module contents

The module consists of three weeks of seminar and hands-on lab exercises on intracellular recordings from leech neurons, as well as computer simulations to study the basis of membrane potential and action potential generation.

The seminar covers the following topics:
- Invertebrate neuronal systems in comparison to vertebrate systems
- Ion channels, membrane potential and action potential generation
- Introduction to electrophysiological methods
- Introduction to data analysis methods

In the practical exercises, portfolio assignments will be performed on:
- Qualitative electrophysiological classification of different cell types in the leech nervous system
- Quantitative analysis (stimulus - response relationship) of at least one cell type
- Action potential generation: Comparison of model simulations and experiments
• Planning a small individual team-work project based on the techniques taught in this module, that can be used as basis for the module neu345

Recommended reading
Course scripts and mandatory scientific literature (3 review articles) discussed in the seminar will be available in Stud.IP Background and seminar literature will be available in Stud.IP

Links

Language of instruction
English

Duration (semesters)
1 Semester

Module frequency
annually, summer term, second half

Module capacity
12 (this module provides the background for neu345 “Neural Computation in invertebrate systems”)

Module level

Type of module
Wahlpflicht / Elective

Teaching/Learning method

Previous knowledge
basic knowledge of neurobiology, basic MATLAB programming skills

Examination
Examination times
Type of examination
Final exam of module
during the course (summer term, second half)
Portfolio consisting of short tests, short reports (according to portfolio assignments) and seminar presentation

Type of course
Comment
SWS
Frequency
Workload of compulsory attendance

Seminar
2
SoSe
28

Exercises
3
SoSe
42

Total module attendance time
70 h
**neu360 - Auditory Neuroscience**

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<tr>
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<td>Credit points</td>
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<td>Workload</td>
<td>180 h</td>
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<td></td>
<td>(1 SWS Lecture (VO))</td>
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<td></td>
<td>Total workload 45h: 14 h contact / 31 h background reading</td>
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<td></td>
<td>1 SWS Seminar (SE)</td>
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<td></td>
<td>Total workload 45h: 14 h contact / 15 h background reading / 16 h preparation and presentation</td>
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<tr>
<td></td>
<td>2 SWS Supervised exercise (UE)</td>
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<td>Total workload 90h: 10 h contact / 20 h literature search / 60 h work on essay paper</td>
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</table>

**Applicability of the module**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

**Responsible persons**
- Köppl, Christine (module responsibility)
- Klump, Georg Martin (Prüfungsberechtigt)
- Köppl, Christine (Prüfungsberechtigt)

**Prerequisites**
Recommended previous knowledge/skills: Basics of Neurosensory Science and Behavioural Biology

**Skills to be acquired in this module**
++ Neurosci. knowlg  + Expt. methods  ++ Scient. Literature  + Social skills  ++ Interdiscipl. knowlg  ++ Data present./disc.  ++ Scientific English  + Ethics

Introduction to Auditory Physiology. May serve as preparation for a Research Module in this area.

Upon successful completion of this course, students
- have profound knowledge on auditory sensory processing at several levels (including cochlear transduction mechanisms, central auditory processing)
- have basic knowledge of the large range of techniques used in auditory research
- are able to read and critically report to others on an original research paper in auditory neuroscience
- are able to research and review a specific topic in auditory neuroscience

**Module contents**
One week introductory block course, comprised of a lecture series and matching seminar that emphasizes discussion.
- Topics:
  - Hair cells: structure, transduction mechanism, receptor potential, synaptic transmission
  - Basilar papilla / cochlea: structure, micromechanics, amplification; otoacoustic emissions
  - Auditory nerve: phase locking, rate coding. Excitation patterns
  - Ascending auditory pathways: wiring, principles of excitation/inhibition, examples of cellular/molecular specialisations
  - Sound localisation in birds and mammals
  - Central auditory processing: imaging techniques, auditory streams, cortex, primates
  - Relation between psychophysics and neurophysiology

The introductory block is followed by a supervised literature search and individually written term paper on a specific topic in auditory neuroscience.

**Recommended reading**
About 20 selected original papers (selection varies)
Pickles JO (2012) An Introduction to the Physiology of Hearing. Brill, Netherlands
<table>
<thead>
<tr>
<th>Links</th>
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<tbody>
<tr>
<td>Language of instruction</td>
<td>English</td>
</tr>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Module frequency</td>
<td>annually, summer term, second half</td>
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<tr>
<td>Module capacity</td>
<td>15 { BM neu211 &quot;Neurosensory Science and Behaviour&quot; or BM neu270 &quot;Neurocognition and Psychophysics&quot; or skills module biox &quot;Current Topics in Hearing Science&quot; }</td>
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<tr>
<td>Reference text</td>
<td>Registration procedure / selection criteria: StudIP, final acceptance after assignment of seminar presentation</td>
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<table>
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<tr>
<th>Module level</th>
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<tr>
<th>Teaching/Learning method</th>
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<table>
<thead>
<tr>
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<table>
<thead>
<tr>
<th>Examination</th>
<th>Examination times</th>
<th>Type of examination</th>
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<tbody>
<tr>
<td>Final exam of module</td>
<td>within a few weeks of the end of summer term lecture period</td>
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<td>SoSe</td>
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<td>Seminar</td>
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<td>1</td>
<td>SoSe</td>
<td>14</td>
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<tr>
<td>Exercises</td>
<td></td>
<td>2</td>
<td>SoSe</td>
<td>28</td>
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| Total module attendance time | 56 h |
psy270 - Functional MRI Data Analysis

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<td>Credit points</td>
<td>9.0 KP</td>
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<tr>
<td>Workload</td>
<td>270 h</td>
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<td>Applicability of the module</td>
<td>• Master's Programme Biology (Master) &gt; Background Modules</td>
</tr>
<tr>
<td></td>
<td>• Master's Programme Neurocognitive Psychology (Master) &gt; Mastermodule</td>
</tr>
<tr>
<td></td>
<td>• Master's Programme Neuroscience (Master) &gt; Background Modules</td>
</tr>
<tr>
<td>Responsible persons</td>
<td>• Gießing, Carsten (module responsibility)</td>
</tr>
<tr>
<td></td>
<td>• Gießing, Carsten (Prüfungsberechtigt)</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Enrolment in Master's programme Neurocognitive Psychology, Neuroscience, or Biology.</td>
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</table>

Skills to be acquired in this module

Goals of module:
Students will learn the basics about planning and performing a neuroimaging study. They will focus on the statistical and methodological background of functional neuroimaging data analysis and analyse a sample functional MRI data set.

Competencies:
++ experimental methods
++ statistics & scientific programming
+ data presentation & discussion
++ group work

Module contents

Theoretical knowledge on functional MRI data analysis
Planning, performance and analysis of functional neuroimaging studies using MATLAB-based software
Hands-on fMRI data analysis with SPM

Recommended reading


Links

Language of instruction English
Duration (semesters) 1 Semester
Module frequency The module will be offered every summer term.
Module capacity 15 (The remaining places are reserved for Biology and Neuroscience students.)
Reference text Since the module is primarily offered for the Master's programme Biology it has to be offered as a blocked course. Please contact us if you are interested in the module but have problems with interfering other courses.

PLEASE NOTE:
We strongly recommend to take either psy170, psy270, psy280, or psy220 to gain
methodological competencies (EEG, fMRI, TBS, HCI) that are needed for most practical projects and Master's theses!

<table>
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<th>Module level</th>
<th>MM (Mastermodul / Master module)</th>
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<tbody>
<tr>
<td>Type of module</td>
<td>Wahlpflicht / Elective</td>
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<tr>
<td>Teaching/Learning method</td>
<td>blocked course with lecture, interactive seminar and exercise parts</td>
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<tr>
<td>Previous knowledge</td>
<td>Students need to have solid statistical knowledge as taught in the Introductory Course Statistics and in Research Methods.</td>
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<tr>
<td>Examination</td>
<td>Examination times</td>
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<td>Final exam of module</td>
<td>middle of summer term</td>
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<tr>
<td></td>
<td>Type of examination</td>
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<tr>
<td></td>
<td>Oral or written examination</td>
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<td>Required active participation for gaining credits: 1-2 presentations participation in discussions on other presentations attendance of at least 70% in the seminars and exercises within one semester (will be checked in StudIP).</td>
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<tr>
<td>Workload Präsenzzeit</td>
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**neu380 - Neuroethology and Neurogenetics: Insect Models**

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<th>Neuroethology and Neurogenetics: Insect Models</th>
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<tbody>
<tr>
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<td>Workload</td>
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</table>
| Applicability of the module | • Master's Programme Biology (Master) > Background Modules  
• Master's Programme Neuroscience (Master) > Background Modules |
| Responsible persons | • Albert, Jörg (module responsibility)  
• Clemens, Jan (Prüfungsberechtigt)  
• Albert, Jörg (Prüfungsberechtigt)  
• Albert, Jörg (Module counselling)  
• Clemens, Jan (Module counselling) |
| Prerequisites | Enrolment in Master program Neuroscience or Biology.  
Students from other programs are welcome if space is available  
Attendance in pre-meeting |

**Skills to be acquired in this module**

**Goals of this module:**

Upon completion of this module, students...

- Have knowledge on the emergence of behavior from neurosensory activation
- Have learned about the interdependencies between signals and their receivers (keyword: matched filters)
- Have a basic understanding of the multiple determinants of behavior: molecular (e.g. genes), cellular (e.g. neurons), organismic (e.g. individuals), environmental (e.g. noise) and inter-individual (e.g. communication)
- Have acquired basic skills in data analysis
- Have acquired basic understanding of sensory signal processing
- Have acquired an intuitive understanding of the multi-causal nature of behavior and the corresponding multiple levels of investigation

**Skills to be acquired/competencies:**

++ Neuroscience knowledge
++ Experimental Methods
+ Scientific Literature
+ Social skills
+ Maths/Stats/Programming
+ Independent Research
+ Data presentation/discussion
+ Scientific English
+ Ethics

**Module contents**

The module consists of three weeks of seminar and hands-on lab exercises on insect behavioral experiments and electrophysiology (extracellular recordings from Drosophila or mosquito neurons).

The seminar covers the following topics:

- Introduction to Dipteran courtship behaviour (fruit flies and mosquitoes): common mechanisms and principles
- The cellular and molecular basis of Dipteran courtship: Between shared evolution and species-specific adaptation
- Introduction to the neurophysiological and neurogenetic toolbox to dissect behaviour (optogenetic, biophysical, behavioural)
- Introduction to data analysis methods

In the practical exercises, portfolio assignments will be performed on:

- Quantitative analysis of neural responses (electrophysiology, reporter imaging) from Dipteran insects
Quantitative analysis of behavioural responses from Dipteran insects (e.g. courtship behaviour, flight tones)
Design and Testing of different stimuli to probe neural and behavioural responses

Recommended reading
Course scripts and mandatory scientific literature (3 review articles) discussed in the seminar will be available in Stud.IP
Background and seminar literature will be available in Stud.IP

Links

Languages of instruction

Duration (semesters) 1 Semester
Module frequency annually, summer term, first half
Module capacity 12
Reference text Recommended combination with neu341 and neu650

Module level

Type of module

Teaching/Learning method

Previous knowledge

Examination Examination times Type of examination

Final exam of module During the course (assignment tasks) Portfolio, consisting of short tests and short reports to portfolio tasks (see above)

Type of course Comment SWS Frequency Workload of compulsory attendance

Seminar 2 SoSe 28 Contact (hours): 28 Self-study and preparation for exam (hours): 44 Total workload (hours): 72

Exercises 3 SoSe 42 Contact (hours): 42 Self-study and preparation (hours): 66 Total workload (hours): 108

Total module attendance time 70 h
Research Modules

bio810 - Independent Research

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<tr>
<td>Workload</td>
<td>450 h</td>
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**Applicability of the module**
- Master's Programme Biology (Master) > Research Modules
- Master's Programme Biology (Master) > Research Modules

**Responsible persons**
- Zotz, Gerhard (module responsibility)
- Zotz, Gerhard (Prüfungsberechtigt)
- der Biologie, Lehrende (Prüfungsberechtigt)

**Prerequisites**
External research projects are done on an individual basis. They are supervised by one person from Oldenburg (see list of examiners, https://uol.de/fk5/studium/studiengaenge/pruefungsberechtigt) and a local supervisor at any university or research institution in Germany and abroad. Please contact Gerhard Zotz (Gerhard.zotz@uol.de) for details. See https://uol.de/ibu/studium-und-lehre/fach-master-biology/downloads-und-links/ (Learning Agreement for External Research Module)

**Skills to be acquired in this module**
++ deepened biological expertise
++ deepened knowledge of biological working methods
++ data analysis skills
++ critical and analytical thinking
++ independent searching and knowledge of scientific literature
++ ability to perform independent biological research
++ data presentation and discussion (written and spoken)
+ teamwork
++ project and time management
++ statistics & scientific programming

Students perform individual research projects to learn:
- planning and organization of a research project in a group outside of University of Oldenburg
- formulate a scientific hypothesis
- planning, performing and analyzing experiments and / or simulations
- working with scientific background literature on the specific context of the project
- oral presentation and discussion of backgrounds and results in the lab seminar
- write a scientific report in publication format
- prepare and present a scientific poster

**Module contents**
Students are introduced to independent research in a specific area of biology by a scientific working group outside of the regular IBU Biology faculty at the University of Oldenburg (usually a university research institute in Germany or abroad).

The content and venue of this module is chosen in close coordination with the Prüfungsausschuss Master Biologie, possibly with consultations of other professors. Course work should cover all parts of a scientific project, i.e. data collection, data analysis and the presentation of the results. Irrespective of the particular venue (universities, research institutes) the student has to report to a professor in Oldenburg in form of a written report and an oral presentation, both in English.

Note: all members of the regular IBU Biology faculty at the University of Oldenburg can act as local supervisor (see list of examiners, https://uol.de/fk5/studium/studiengaenge/pruefungsberechtigt), students should contact appropriate supervisors individually prior to project start, external and local supervisors must fill the learning agreement form. The supervisor at the host institution is invited to submit a short written statement of assessment, final grading is done by the local supervisor. Participation in a joint poster presentation of concurrent research modules is highly recommended.

**Recommended reading**
varies with chosen topic

**Languages of instruction**
English, German

**Duration (semesters)**
1 Semester

**Module frequency**
halbjährlich

**Module capacity**
unlimited

**Module level**

**Type of module**

<table>
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<th>Previous knowledge</th>
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<tbody>
<tr>
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<td>Examination times</td>
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<td></td>
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<td>Final exam of module</td>
<td>internship report</td>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
</tr>
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<tbody>
<tr>
<td>Seminar</td>
<td></td>
<td>1</td>
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<td>14</td>
</tr>
<tr>
<td>Projektorientiertes Modul</td>
<td></td>
<td>10</td>
<td>SoSe und WiSe</td>
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<tr>
<td><strong>Total module attendance time</strong></td>
<td></td>
<td></td>
<td></td>
<td>154 h</td>
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### bio820 - Research Module Fast Track

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Module abbreviation</td>
<td>bio820</td>
</tr>
<tr>
<td>Credit points</td>
<td>15.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>450 h</td>
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<tr>
<td>Applicability of the module</td>
<td>• Master's Programme Biology (Master) &gt; Research Modules</td>
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<tr>
<td></td>
<td>• Master's Programme Biology (Master) &gt; Research Modules</td>
</tr>
<tr>
<td>Responsible persons</td>
<td>• Klump, Georg Martin (module responsibility)</td>
</tr>
<tr>
<td></td>
<td>• Klump, Georg Martin (Prüfungsberechtigt)</td>
</tr>
</tbody>
</table>

#### Prerequisites

- ++ deepened biological expertise
- ++ deepened knowledge of biological working methods
- ++ data analysis skills
- ++ critical and analytical thinking
- ++ independent searching and knowledge of scientific literature
- ++ ability to perform independent biological research
- ++ data presentation and discussion in German and English (written and spoken)
- + teamwork
- ++ project and time management
- ++ statistics & scientific programming

#### Module contents

#### Recommended reading

#### Links

**Languages of instruction**

- German, English

**Duration (semesters)**

- 1 Semester

**Module frequency**

- unregelmäßig

**Module capacity**

- unlimited

**Module level**

- Type of module

**Teaching/Learning method**

**Previous knowledge**

<table>
<thead>
<tr>
<th>Examination</th>
<th>Examination times</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td></td>
<td>written report</td>
</tr>
</tbody>
</table>

**Type of course**

- Seminar

**SWS**

- Frequency --

**Workload Präsenzzzeit**

- 0 h
**bio900 - Biology Research Module**

<table>
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<tr>
<th>Module label</th>
<th>Biology Research Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module abbreviation</td>
<td>bio900</td>
</tr>
<tr>
<td>Credit points</td>
<td>15.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>450 h</td>
</tr>
<tr>
<td>Applicability of the module</td>
<td>• Master’s Programme Biology (Master) &gt; Research Modules</td>
</tr>
<tr>
<td></td>
<td>• Master’s Programme Biology (Master) &gt; Research Modules</td>
</tr>
<tr>
<td>Responsible persons</td>
<td>• Zotz, Gerhard (module responsibility)</td>
</tr>
<tr>
<td></td>
<td>• Zotz, Gerhard (Prüfungsberechtigt)</td>
</tr>
<tr>
<td></td>
<td>• der Biologie, Lehrende (Prüfungsberechtigt)</td>
</tr>
<tr>
<td></td>
<td>• der Biologie, Lehrende (Module counselling)</td>
</tr>
</tbody>
</table>

**Responsible persons**
- Zotz, Gerhard (module responsibility)
- Zotz, Gerhard (Prüfungsberechtigt)
- der Biologie, Lehrende (Prüfungsberechtigt)
- der Biologie, Lehrende (Module counselling)

**Prerequisites**

Students will learn to plan, perform and analyse a study in a biological field. Topics will be chosen in close coordination with teaching staff. Depending on the particular project, knowledge in statistics, molecular biology, physiology, modelling, or ethology will be necessary. Results will be related to the current biological literature in a written report and be presented in the seminar of the hosting working group.

- + deepened knowledge of biological working methods
- ++ data analysis skills
- ++ critical and analytical thinking
- ++ independent searching and knowledge of scientific literature
- ++ ability to perform independent biological research
- ++ data presentation and discussion in German and English (written and spoken)
- + teamwork
- ++ project and time management
- + statistics & scientific programming

**Module contents**

The students develop an empirical investigation, carry it out and analyse the results. The students present and discuss their project both orally and in writing.

**Recommended reading**

https://uol.de/en/biology/groups-our-research

**Languages of instruction**

German, English

**Duration (semesters)**

1 Semester

**Module frequency**

unlimited

**Reference text**

Students can choose between many options of individual projects, offered by the different groups involved in the MScBiology study program. All members of the regular IBU Biology faculty at the University of Oldenburg can act as local supervisor (see list of examiners, https://uol.de/fk5/studium/studiengaenge/pruefungsberechtigte). Please refer to the list of options in Stud.IP and contact potential supervisors directly.

Within the Modul bio900 is it possible to take several courses as long as their contents differ substantially. When taking the course group 5.02.960 it is mandatory to choose two courses out of the group A – D.

**Module level**

**Type of module**

Teaching/Learning method

**Previous knowledge**

**Examination**

**Examination times**

**Type of examination**

**Final exam of module**

internship report

**Type of course**

**Comment**

**SWS**

**Frequency**

**Workload of compulsory attendance**

<table>
<thead>
<tr>
<th>Type of course</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td></td>
<td>SoSe oder WiSe</td>
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<tr>
<td>Seminar</td>
<td></td>
<td></td>
<td>SoSe oder WiSe</td>
<td>0</td>
</tr>
<tr>
<td>Projektorientiertes Modul</td>
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<td>10</td>
<td>SoSe und WiSe</td>
<td>140</td>
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<tr>
<td>Type of course</td>
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<td>SWS</td>
<td>Frequency</td>
<td>Workload of compulsory attendance</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------</td>
<td>-----</td>
<td>-----------</td>
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</tr>
<tr>
<td>Total module attendance time</td>
<td></td>
<td>140</td>
<td>h</td>
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</table>
Skills Modules

bio870 - Communicating Plant Sciences

<table>
<thead>
<tr>
<th>Module label</th>
<th>Communicating Plant Sciences</th>
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</thead>
<tbody>
<tr>
<td>Module abbreviation</td>
<td>bio870</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
</tbody>
</table>

Applicability of the module
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules

Responsible persons
- Zotz, Gerhard (module responsibility)
- Albach, Dirk Carl (Module counselling)
- Schmaljohann, Heiko (Module counselling)
- Zotz, Gerhard (Prüfungsberechtigt)
- Albach, Dirk Carl (Prüfungsberechtigt)
- Schmaljohann, Heiko (Prüfungsberechtigt)
- Nolte, Arne (Prüfungsberechtigt)
- Will, Maria (Prüfungsberechtigt)

Prerequisites
Communicating and practicing scientific presentation techniques (talk, publication, poster) Presentation of data and discussion in spoken and written (English) Communicating of techniques in problem treatment in free speech and scientific writing Independent investigation and knowledge of scientific primary literature

++ interdisciplinary thinking
++ critical and analytical thinking
++ independent searching and knowledge of scientific literature
++ data presentation and discussion (written and spoken)

Module contents
- S: Working group seminar (2 SWS; Choice 1: Functional Ecology; Choice 2: Evolutionary genetics of plants; Choice 3: Plant biodiversity and evolution) S: Scientific Writing in Plant Science (2SWS)

Recommended reading

Links

Languages of instruction
- German, English

Duration (semesters)
- 1 Semester

Module frequency

Module capacity
- 12

Module level

Type of module
- je nach Studiengang Pflicht oder Wahlpflicht

Teaching/Learning method

Previous knowledge

Examination

Examination times

Type of examination

Final exam of module

Type of course
- Seminar

SWS
- 4

Frequency
- WiSe

Workload Präsenzzeit
- 56 h
bio880 - Skills in Plant Systematics

Module label: Skills in Plant Systematics
Module abbreviation: bio880
Credit points: 6.0 KP
Workload: 180 h

Applicability of the module:
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules

Responsible persons:
- Albach, Dirk Carl (module responsibility)
- von Hagen, Klaus Bernhard (Module counselling)
- Albach, Dirk Carl (Prüfungsberechtigt)
- von Hagen, Klaus Bernhard (Prüfungsberechtigt)
- Khan, Gulzar (Prüfungsberechtigt)

Prerequisites:
In this module, we provide the skills necessary to describe and distinguish species for floras and monographs/first publication of species. For that, an overview over the plant kingdom is provided. Further, various non-molecular methods of systematics are practiced, such as morphometry, SEM, identification key generation, nomenclature, species delimitation methods, and interpretation of phylogenetic analyses.

- Deepened biological expertise
- Deepened knowledge of biological working methods
- Data analysis skills + critical and analytical thinking
- Independent searching and knowledge of scientific literature
- Ability to perform independent biological research
- Data presentation and discussion (E) (written and spoken)
- Teamwork
- Statistics & scientific programming

Module contents:
In the seminar we provide an overview over the larger groups of plants and characters for their grouping. We analyse methods for phylogeny generation, angiosperm classification and description of new taxa. In the exercises morphological characters are investigated in various ways and internet resources for further morphological characters presented. Species delimitation methods for molecular and morphological characters are used. Identification keys are generated and nomenclatural rules discussed.

Recommended reading

Languages of instruction: German, English

Duration (semesters): 1 Semester

Module frequency
Module capacity: 8

Module level

Type of module
Teaching/Learning method

Previous knowledge

Examination Examination times Type of examination
Final exam of module 1 presentation 1 report

Type of course Comment SWS Frequency Workload of compulsory attendance

Seminar 2 WiSe 28
Exercises 2 WiSe 28

Total module attendance time: 56 h
bio890 - Current Topics in Biology

Module label: Current Topics in Biology
Module abbreviation: bio890
Credit points: 3.0 KP
Workload: 90 h

Applicability of the module:
- Master's Programme Biology (Master) > Skills Modules

Responsible persons:
- Gerlach, Gabriele (module responsibility)
- der Biologie, Lehrende (Module counselling)
- Gerlach, Gabriele (Prüfungsberechtigt)
- Laakmann, Silke (Prüfungsberechtigt)

Prerequisites:

Skills to be acquired in this module:
- + biological knowledge
- + biologically relevant, natural / mathematical scientific basic knowledge
- ++ interdisciplinary knowledge and thinking
- ++ abstract, logical, and analytical thinking
- ++ expanded knowledge in a specific biological field
- ++ presentation of results and factual discussion, both written and spoken
- ++ (scientific) communication skills

To develop skills in the critical analysis and interpretation of results and themes in diverse areas of modern biology, including (but not limited to) evolutionary biology, population genetics, biodiversity, ecology, genomics, ornithology, and neurobiology.

Module contents:
Discussion and interpretations of one or more themes in modern biology. The themes and exact content will be provided by the instructor(s) at the beginning of the course. The module bio890 may be taken more than once as long as the content covered in the seminars differ substantially.

Recommended reading:
Varies with chosen topic (will be provided by the instructor(s) at the beginning of the course)

Languages of instruction:
English, German

Duration (semesters):
1 Semester

Module frequency:
unlimited

Module level:

Type of module:
Teaching/Learning method:

Previous knowledge:

Examination:
Examination times:
Type of examination:
Final exam of module: open
Final exam of module: 1 Portfolio. Components vary in the seminars. They are specified in Stud.IP in the respective seminar.

Type of course:
Seminar

SWS:
2

Frequency:
SoSe und WiSe

Workload Präsenzzeit:
28 h
**bio777 - Objekte in wissenschaftlichen Sammlungen: Konservierung, Management und Forschungsfragen**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Module abbreviation</th>
<th>Credit points</th>
<th>Workload</th>
<th>Applicability of the module</th>
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</thead>
<tbody>
<tr>
<td>Objekte in wissenschaftlichen Sammlungen: Konservierung, Management und Forschungsfragen</td>
<td>bio777</td>
<td>6.0 KP</td>
<td>180 h</td>
<td>Master's Programme Biology (Master) &gt; Skills Modules</td>
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</table>

<table>
<thead>
<tr>
<th>Responsible persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will, Maria (module responsibility)</td>
</tr>
<tr>
<td>Albach, Dirk Carl (Module counselling)</td>
</tr>
<tr>
<td>von Lindern, Klara (Module counselling)</td>
</tr>
<tr>
<td>Will, Maria (Prüfungsberechtigt)</td>
</tr>
<tr>
<td>von Lindern, Klara (Prüfungsberechtigt)</td>
</tr>
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</table>

**Prerequisites**

**Skills to be acquired in this module**

- deepened biological expertise
- deepened knowledge of biological working methods
- interdisciplinary thinking
- critical and analytical thinking
- independent searching and knowledge of scientific literature
- ability to perform independent biological research
- data presentation and discussion (written and spoken)
- teamwork
- ethics and professional behaviour
- project and time management

**Module contents**

- history of collections at universities and their importance for developing scientific theories;
- origin/formation of collections (objects in time and space)
- the collections of the CvO (overview) and their importance as infrastructure for teaching, learning and research
- collection work in biological collections such as botanical garden, natural history museums, didactical collections or the herbarium (concepts, object handling, conservation, documentation & digitalisation)
- developing research questions and projects based on objects/collections, e.g., provenance research
- communicating object-based topics (e.g., speed talk presenting current scientific articles)

**Recommended reading**

 articles and book chapters referring to (1) the history/presence/future of collections, (2) collection management and (3) research projects based on objects/collections

**Links**

https://uol.de/kustodien/zertifikatsprogramm

**Languages of instruction**

German, English

**Duration (semesters)**

1 Semester

**Module capacity**

10 (Vorlesung & Seminar als transdisziplinäre LV in Kooperation mit Fak. III)
verknüpft mit dem Modul bio783 "Object-based Research Projects in Biological Collections" (unabhängig Belegung möglich).

Wegen inhaltlicher Überschneidungen kann das Modul nicht zusätzlich zu pb335 belegt werden.

Module level
MM (Mastermodul / Master module)

Type of module
Wahlmodul / Opportunity

Teaching/Learning method

Previous knowledge

Examination

Examination times

Type of examination

Final exam of module

2 Prüfungsleistungen:
- 1 Klausur oder 1 mündliche Prüfung (100%)
- 1 Fachpraktische Übung (unbenotet)

Type of course
Comment
SWS
Frequency
Workload of compulsory attendance

Lecture
1
WiSe
14

Seminar
2
WiSe
28

Exercises
1
WiSe
14

Total module attendance time
56 h
bio783 - Object-based Research Projects in Biological Collections

<table>
<thead>
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<tbody>
<tr>
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<tr>
<td>Credit points</td>
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<td>Applicability of the module</td>
<td>Master's Programme Biology (Master) &gt; Skills Modules</td>
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<td>Master's Programme Biology (Master) &gt; Skills Modules</td>
</tr>
<tr>
<td>Responsible persons</td>
<td>Will, Maria (module responsibility)</td>
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<tr>
<td></td>
<td>Albach, Dirk Carl (Module counselling)</td>
</tr>
<tr>
<td></td>
<td>Will, Maria (Prüfungsberechtigt)</td>
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</tbody>
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Prerequisites

Skills to be acquired in this module

- +deepened biological expertise
- ++deepened knowledge of biological working methods
- +data analysis skills
- ++interdisciplinary thinking
- +critical and analytical thinking
- ++independent searching and knowledge of scientific literature
- ++ability to perform independent biological research
- ++data presentation and discussion in German and English (written and spoken)
- +teamwork
- +ethics and professional behaviour
- ++project and time management

Module contents

- documentation of a natural history collection (e.g., university or from an herbarium) including a description of the object(s), digitalization, check for traces of use and/or damage;
- if needed: restauration, i.e. fixing loose plants on herbarium vouchers;
- trace biographies of the collector and the collection/object (provenance);
- trace comparable collections using databases;
- as far as possible: identification/validation of scientific identification using databases and scientific literature
- generating and answer scientific questions based on the collection or develop an educational approach (e.g., teaching lecture)
- communicate the results, i.e. prepare a poster for a congress and defend your theses and summarize the results in a manuscripts;

Recommended reading

- scientific literature corresponding to the individual research project

Links

Languages of instruction

- German, English

Duration (semesters)

- 1 Semester

Module frequency

- irregular

Module capacity

- 4

Reference text


Module level

Type of module
<table>
<thead>
<tr>
<th>Teaching/Learning method</th>
<th>Previous knowledge</th>
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<tbody>
<tr>
<td>Examination</td>
<td>Examination times</td>
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<tr>
<td>Final exam of module</td>
<td>Type of examination</td>
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<td>individual</td>
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<td>1 Portfolio</td>
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<td>Type of course</td>
<td>Exercises</td>
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<tr>
<td>SWS</td>
<td>4</td>
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<tr>
<td>Frequency</td>
<td>WiSe</td>
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<tr>
<td>Workload Präsenzeit</td>
<td>56 h</td>
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</table>
neu730 - Biosciences in the Public Eye and in our Laws

<table>
<thead>
<tr>
<th>Module label</th>
<th>Biosciences in the Public Eye and in our Laws</th>
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<tbody>
<tr>
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<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
<tr>
<td>(56h contact / 84h research for presentations / 40h term paper)</td>
<td></td>
</tr>
</tbody>
</table>

### Applicability of the module
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

### Responsible persons
- Köppl, Christine (module responsibility)
- Sienknecht, Ulrike (Module counselling)
- Köppl, Christine (Prüfungsberechtigt)
- Sienknecht, Ulrike (Prüfungsberechtigt)

### Prerequisites
- Skills to be acquired in this module:
  + Exp. methods
  + Scient. Literature
  ++ Social skills
  ++ Interdiscipl. knowlg
  + Data present./idisc.
  + Scientific English
  ++ Ethics

### Skills to be acquired in this module
- know basic rules of good scientific practise
- are aware of the legal framework that is relevant to biological research, e.g. on animal welfare or genetically modified organisms
- have practised to research and summarize different viewpoints on biological research, using both scientific (peer-reviewed) and non-scientific sources
- are able to identify and critically discuss ethical conflicts in biological research, e.g., in the context of stem cell research or data manipulation
- are able to prepare and give a coherent presentation in a team
- have practised to lead a group discussion

### Module contents
In supervised exercises, students research the ethical aspects and controversial issues on several specific topics in the biosciences. Everyone participates in researching all topics. Students then take turns in summarizing and presenting each topic in small teams, and leading a critical discussion of each topic. Problem-based, independent research of the scientific background by the students is an integral part of this module.

Example topics:
- Good scientific practise and fraud
- Neouroenhancement
- Artificial intelligence
- Animal welfare, Animal experiments
- Overfishing, Nature conservation
- State-of-the-art genetic tools and their implications
- Genetically modified organisms, e.g., in food production, chimeras
- Stem cells
- Humans as experimental subjects

A bonus can be obtained through active participation during the semester. Active participation requires regular oral contributions to the group discussions, that go beyond giving your own talks.

A bonus improves the exam mark by one step (0.3 or 0.4). The bonus is optional, an exam mark of 1.0 is achievable without a bonus. A bonus cannot be applied to pass a failed exam.

### Recommended reading

### Links

### Language of instruction
English

### Duration (semesters)
1 Semester

### Module frequency
annually, summer term

### Module capacity
18
<table>
<thead>
<tr>
<th>Module level</th>
<th>MM (Mastermodul / Master module)</th>
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</thead>
<tbody>
<tr>
<td>Type of module</td>
<td>Wahlpflicht / Elective</td>
</tr>
</tbody>
</table>

**Teaching/Learning method**

| Previous knowledge | Fundamentals of genetics, physiology, ecology and biological systematics |

**Examination**

<table>
<thead>
<tr>
<th>Examination</th>
<th>Examination times</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>within a few weeks of summer term lecture period</td>
<td>Term paper&lt;br&gt;Regular participation during the semester is required (max 3 days of absence)</td>
</tr>
</tbody>
</table>

**Type of course**

<table>
<thead>
<tr>
<th>Type of course</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td></td>
<td>SoSe</td>
<td>0</td>
</tr>
<tr>
<td>Seminar und Übung</td>
<td>4</td>
<td>SoSe</td>
<td></td>
<td>56</td>
</tr>
</tbody>
</table>

**Total module attendance time**

| Total module attendance time | 56 h |
neu751 - Laboratory Animal Science

Module label | Laboratory Animal Science
---|---
Module abbreviation | neu751
Credit points | 3.0 KP

Workload | 90 h
| one week full-time in semester break + flexible time for studying and exam preparation

1 SWS Lecture
| total workload 45h: 2h contact / 20h background reading / 23h exam preparation
1 SWS Supervised exercise
| total workload 45h: 35h contact / 10h background reading

Applicability of the module
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Molecular Biomedicine (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Responsible persons
- Köppl, Christine (module responsibility)
- Köppl, Christine (Prüfungsberechtigt)
- Langemann, Ulrike (Prüfungsberechtigt)
- Nolte, Arne (Prüfungsberechtigt)
- Heyers, Dominik (Prüfungsberechtigt)
- Ebbers, Lena (Prüfungsberechtigt)
- Dedek, Karin (Prüfungsberechtigt)
- Schmaljohann, Heiko (Prüfungsberechtigt)
- Winkhofer, Michael (Prüfungsberechtigt)

Prerequisites
- none

Skills to be acquired in this module
- ++ Expt. Methods
- + Independent Research
- + Scient. Literature
- ++ Social skills
- ++ Interdiscipl. knowlg
- + Scientific English
- ++ Ethics

Upon successful completion of this course, students
- know the relevant EU legislation governing animal welfare and are able to explain its meaning in common language
- understand and are able to critically discuss salient ethical concepts in animal experimentation, such as the three Rs and humane endpoint.
- have basic knowledge of the biology and husbandry of laboratory animal species held at the University of Oldenburg (rodents or birds or fish)
- are able to critically assess the needs and welfare of animals without compromising scientific integrity of the investigation
- have practical skills in handling small rodents or birds or fish
- have profound knowledge of anaesthesia, analgesia and basic principles of surgery.
- have practised invasive procedures and euthanasia.

NOTE: These objectives aim to satisfy the requirements for EU directive A „Persons carrying out animal experiments” and EU directive D „Persons killing animals”.

Module contents
- Background knowledge is taught using the third-party online platform “LAS Interactive” which concludes with a written exam that has to be passed before the practical part. Topics covered are:
  - Legislation, ethics and the 3Rs
  - Scientific integrity
  - Data collection 
  - Basic biology of rodents, birds and fish
  - Husbandry, diet and nutrition of rodents, birds and fish
  - Animal Welfare
  - Health monitoring
  - Pain and distress
  - Euthanasia
Practical procedures will first be demonstrated, important aspects will then be practiced under supervision by every participant, on an animal model of their choice (rodents, birds or fish):

- Handling and external examination
- Administration of substances, blood sampling
- Euthanasia and dissection
- Transcardial perfusion
- Anaesthesia and surgery

Recommended reading
- "LAS interactive" internet-based learning platform

Links

Language of instruction
- English

Duration (semesters)
- 1 Semester

Module frequency
- semester break, every semester

Module capacity
- 20

Recommended reading
- "LAS interactive" internet-based learning platform

Links

Duration (semesters)
- 1 Semester

Module frequency
- semester break, every semester

Module capacity
- 20

<table>
<thead>
<tr>
<th>Module level</th>
</tr>
</thead>
</table>

Type of module

Teaching/Learning method

Previous knowledge

Examination
- Examination times
- Type of examination

Final exam of module
- immediately before the practical part
- written exam of 90 minutes

<table>
<thead>
<tr>
<th>Type of course</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>1</td>
<td>SoSe und WiSe</td>
<td>14</td>
</tr>
<tr>
<td>Exercises</td>
<td></td>
<td>1</td>
<td>SoSe und WiSe</td>
<td>14</td>
</tr>
</tbody>
</table>

Total module attendance time
- 28 h
### Module Contents
Lectures cover:
- characteristics of the different forms of scientific presentations
- sentence structure using the passive voice
- scientific vocabulary and terminology as contrasted to common speech
- appropriate language for communication with scientific editors and referees

Students read neuroscience texts of an advanced level and practice explaining and presenting these in both written and oral form. They also practice different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone). Emphasis is placed on individual problems in pronunciation and language use errors.

### Recommended Reading
http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf

### Links

### Language of instruction
English

### Duration (semesters)
1 Semester

### Module frequency
annually, semester break

### Module capacity
12

### Module level

### Type of module

### Teaching/Learning method

### Previous knowledge
minimum English level B2 (C1 preferred) according to Common European Framework of Reference for Languages (CEFR) priority to non-native speakers, higher semester

### Examination

### Examination times

### Type of examination
<table>
<thead>
<tr>
<th>Examination</th>
<th>Examination times</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Final exam of module</strong></td>
<td>within 2 months of completing the course</td>
<td>Portfolio: 70% several quick tests, texts, presentations, 30% term paper. Bonus system for active participation</td>
</tr>
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</table>

<table>
<thead>
<tr>
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<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
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<td>0.5</td>
<td></td>
<td>WiSe</td>
<td>7</td>
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<tr>
<td>Exercises</td>
<td>3.5</td>
<td></td>
<td>WiSe</td>
<td>49</td>
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</table>

**Total module attendance time**: 56 h
neu780 - Biological Data Analysis with Python

Module label: Biological Data Analysis with Python

Module abbreviation: neu780

Credit points: 6.0 KP

Workload: 180 h

Applicability of the module
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Responsible persons
- Winklhofer, Michael (module responsibility)
- Winklhofer, Michael (Prüfungsberechtigt)

Prerequisites

Skills to be acquired in this module
- Neurosci. knowlg.
- Maths/Stats/Progr.
- Data present./disc.

The objective of the module is the acquisition of programming skills with focus on analysis of neurobiological datasets, using the programming language python. Python is available for any computer platform (PC, Mac, Linux) and is open source (for free), see [https://www.python.org/](https://www.python.org/).

Students will learn how to write effective scripts for data processing and visualisation, making use of pre-existing program libraries for various generic purposes (maths, statistics, plotting, image analysis).

Typical applications will be analysis of time series (e.g., electrophysiological recordings, movement data), images (e.g. immunohistochemical images, MRI slices), and spatio-temporal correlations in volume data. Students will also learn how to produce synthethica data from various noise models to assess signal-to-noise ratio in instrumental datasets.

Module contents
- Data types and data structures, control structures, functions, modules, file input/output
- Standard libraries and SciPy libraries (Matplotlib, NumPy,...), scikit-image, VPython, ...

Recommended reading
- [open access](#)
- [http://docs.python.org/3/tutorial/index.html](http://docs.python.org/3/tutorial/index.html)

Links

Language of instruction: English

Duration (semesters): 1 Semester

Module frequency: semester break, annually

Module capacity: 20

Reference text: Shared course components with (cannot be credited twice): pb328 "Einführung in Datenanalyse mit Python" (Professionalisierungsmodul im Bachelorstudiengang Biologie)

Module level

Type of module

Teaching/Learning method

Previous knowledge

Examination examination times Type of examination

Final exam of module term break, immediately after the course (2 weeks in February) assignment of programming exercises, 4 out of 5 exercises to be assessed

Type of course Comment SWS Frequency Workload of compulsory attendance

Lecture 2 WiSe 28
Exercises 2 WiSe 28

Total module attendance time: 56 h
**neu790 - Communicating Neuroscience**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Communicating Neuroscience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module abbreviation</td>
<td>neu790</td>
</tr>
<tr>
<td>Credit points</td>
<td>3.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>90 h</td>
</tr>
<tr>
<td></td>
<td>90 h (28 h contact / 62 h individual reading and preparing discussion questions)</td>
</tr>
</tbody>
</table>

**Applicability of the module**
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

**Responsible persons**
- Kretzberg, Jutta (module responsibility)
- Kretzberg, Jutta (Prüfungsberechtigt)
- Köppl, Christine (Prüfungsberechtigt)

**Prerequisites**
- + Neurosci. knowlg.
- ++ Scient. Literature
- ++ Social skills
- + Interdiscipl. knowlg.
- ++ Data present./disc.
- + Scientific English
- ++ Ethics

Upon successful completion of this course, students will have thought about and discussed in depth scientific, social and ethical aspects of communication in and about neuroscience. In particular, participants practice critical reading of neuroscience literature, learn about the scientific publication process and discuss science communication to the general public.

**Module contents**

The overall goal of critical discussion of neuroscientific results in a scientific, social and ethical context requires preparation and active participation both before (Stud.IP wiki) and during the weekly sessions. Each participant is responsible for the preparation and moderation of at least one session in a group of 2-3 students. For passing the module, additional active participation is required in at least 10 of the seminar sessions. The specific papers and topics that are discussed vary, but typically cover:

- How to find literature?
- How to read different types of scientific papers: Classic papers, review papers, perspective papers, recent original papers?
- Publication process, Authorship and impact metrics
- Alternative publication paths and data sharing in neuroscience
- Science communication for the general public and on social media
- Face-to-face scientific communication

**Recommended reading**

List of published papers, as well as online resources for preparation will be selected by the teachers and participants and announced via Stud.IP.

Background neuroscience textbooks, e.g.:

- Galizia, Lledo 'Neuroscience – From Molecule to Behavior', 2013, Springer
- Nicholls et al. 'From Neuron to Brain', 5th edition 2012, Sinauer
Links

Related content: Science communication workshop:

https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbf
a53d7b3f5e3680f52ac7d0f7

<table>
<thead>
<tr>
<th>Language of instruction</th>
<th>English</th>
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<tbody>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Module frequency</td>
<td>winter semester</td>
</tr>
<tr>
<td>Module capacity</td>
<td>20 (Registration procedure / selection criteria: StudIP)</td>
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<tr>
<td>Module level</td>
<td>MM (Mastermodul / Master module)</td>
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<tr>
<td>Type of module</td>
<td>Wahlpflicht / Elective</td>
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</table>

Teaching/Learning method

<table>
<thead>
<tr>
<th>Previous knowledge</th>
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</thead>
<tbody>
<tr>
<td>Examination</td>
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<tr>
<td>Final exam of module</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of course</th>
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</thead>
<tbody>
<tr>
<td>SWS</td>
</tr>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Workload Präsenzzzeit</td>
</tr>
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</table>
### neu800 - Introduction to Matlab

<table>
<thead>
<tr>
<th>Module label</th>
<th>Introduction to Matlab</th>
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<tbody>
<tr>
<td>Module abbreviation</td>
<td>neu800</td>
</tr>
<tr>
<td>Credit points</td>
<td>3.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>90 h</td>
</tr>
</tbody>
</table>
|                               | (2 SWS Supervised exercise (UE) "Introduction to MATLAB"
|                               | Total workload 90h: 28h contact / 62h practising learned programming skills) |
| Applicability of the module   | • Master's Programme Biology (Master) > Skills Modules
|                               | • Master's Programme Biology (Master) > Skills Modules
|                               | • Master's Programme Neuroscience (Master) > Skills Modules |
| Responsible persons           | • Gießing, Carsten (module responsibility)
|                               | • Gießing, Carsten (Prüfungsberechtigt)     |

#### Prerequisites

**Skills to be acquired in this module**

++ Expt. Methods
+ Social skills
+ Interdiscipl. knowlg.
++ Maths/Stats/Prog.
+ Data present./disc.
+ Scientific English

Within this introductory course students will learn the basics of MATLAB programming. Participants will be introduced in fundamental programming concepts.

#### Module contents

The module comprises an introduction to data structures, flow control, loops, graphics, basic data analyses with MATLAB, scripts and functions.

#### Recommended reading


#### Links

- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: annually, summer term, second half
- Module capacity: 12 (in total with bio640) (shared course components with (cannot be credited twice): bio640)

#### Module level

- Type of module
- Teaching/Learning method

#### Previous knowledge

<table>
<thead>
<tr>
<th>Examination</th>
<th>Examination times</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>end of summer term</td>
<td>Working on exercises</td>
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<table>
<thead>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>Seminar</td>
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<td>SoSe</td>
<td></td>
<td>0</td>
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<tr>
<td>Exercises</td>
<td></td>
<td>SoSe</td>
<td></td>
<td>28</td>
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**Total module attendance time:** 28 h
neu810 - International Meeting Contribution

<table>
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<tr>
<th>Module label</th>
<th>International Meeting Contribution</th>
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<tbody>
<tr>
<td>Module abbreviation</td>
<td>neu810</td>
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<td>Credit points</td>
<td>3.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>90 h</td>
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</table>

<table>
<thead>
<tr>
<th>Applicability of the module</th>
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</thead>
<tbody>
<tr>
<td>Master's Programme Biology (Master) &gt; Skills Modules</td>
</tr>
<tr>
<td>Master's Programme Neuroscience (Master) &gt; Skills Modules</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Responsible persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kretzberg, Jutta (module responsibility)</td>
</tr>
<tr>
<td>Kretzberg, Jutta (Prüfungsberechtigt)</td>
</tr>
<tr>
<td>Köppl, Christine (Prüfungsberechtigt)</td>
</tr>
</tbody>
</table>

Skills to be acquired in this module

+ Neurosci. knowlg.
++ Independent research
+ Scient. Literature
++ Social skills
+ Interdiscipl. knowlg.
++ Data present./disc.
+ Scientific English
+ Ethics

Preparation, presentation and critical discussion of own studies for an international audience:

- participate in an international meeting
- prepare a poster or talk for an international meeting
- present own results in a way that is appropriate for the target audience
- put own studies into the context of scientific literature
- acquire additional knowledge about a broader field of research

Module contents

Active participation in a scientific conference, workshop, summer school etc., lasting a minimum of 3 full days. Student must be the presenter (poster or talk) and an author of the presented work, typically carried out in the context of a research module or the Master thesis.

It is mandatory to present the poster or talk to Christine Köppl or Jutta Kretzberg prior to the meeting and incorporate the feedback on the presentation.

Recommended reading

dependent on the scientific topic

Links

Language of instruction | English |
Duration (semesters) | 1 Semester |
Module frequency | every semester, flexible |
Module capacity | unlimited |
| please contact module organizer individually |
Module level | MM (Mastermodul / Master module) |
Type of module | Wahlpflicht / Elective |

Teaching/Learning method

Previous knowledge

Examination |
| Examination times |
| Type of examination |
Final exam of module |
| presentation (ungraded, pass/fail) |
Type of course | Seminar |
SWS | 2 |
Frequency | SoSe und WiSe |
| Workload Präsenzzzeit | 28 h |
**neu820 - Neuroscience Journal Club**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Neuroscience Journal Club</th>
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</thead>
<tbody>
<tr>
<td>Module abbreviation</td>
<td>neu820</td>
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<tr>
<td>Credit points</td>
<td>3.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>90 h</td>
</tr>
<tr>
<td></td>
<td>(30h contact / 60h reading and preparation of oral and poster presentation)</td>
</tr>
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</table>

**Applicability of the module**
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

**Responsible persons**
- Mertsch, Sonja (module responsibility)
- Mertsch, Sonja (Prüfungsberechtigt)

**Prerequisites**
Students will learn to read, interpret, present and discuss neuroscientific literature.
- ++ Neurosci. knowledge
- + Exptl. Methods
- ++ Scient. Literature
- ++ Social skills
- + Interdiscipl. knowledge
- ++ Data present./disc.
- + Scientific English
- + Ethics

**Module contents**
- Week 1: How to read and present a scientific paper and how to generate a scientific poster? Distribution of papers to participants
- Week 2: Example presentation of a scientific paper by the teacher with discussion
- Week 3-13: Oral presentation / moderation of discussion of one scientific paper per week by one or two student(s)
- Week 14: Short poster presentations of all students

The focus topic of the scientific literature will change between semesters. In winter semester 2021/22, the topic will be regenerative ophthalmology with the focus on tissue engineering.

**Recommended reading**
Scientific literature will be available in Stud.IP

**Language of instruction**
English

**Duration (semesters)**
1 Semester

**Module frequency**
winter term, annually

**Module capacity**
20

**Module level**

**Type of module**
Teaching/Learning method

**Previous knowledge**

**Examination**

<table>
<thead>
<tr>
<th>Examination times</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>during the semester</td>
<td>presentation and attendance of at least 70% in the seminars</td>
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</table>

**Type of course**
Seminar

**SWS**
2

**Frequency**
SoSe und WiSe

**Workload Präsenzzeit**
28 h
### Module contents

**Part 1: Multivariate Statistics I (lecture):**
- Graphical representation of multivariate data
- The Generalized Linear Modeling (GLM) framework
- Multiple and moderated linear regression with quantitative and qualitative predictors
- Logistic regression
- Multilevel regression (Generalized Linear Mixed Effects Modeling – GLMM)
- Non-linear regression models
- Path modeling
- Factor analysis (exploratory & confirmatory)
- (Multilevel) Structural equation modeling (SEM linear and non-linear)

**Part 2: Analysis Methods with R (seminar):**
- Data examples and applications of GLM, GLMM, polynomial, spline and local regression, path modeling, factor analyses and SEM

### Recommended reading

Course material will be available in Stud.IP

### Links

Language of instruction: English

Duration (semesters): 1 Semester

Module frequency: winter term, annually

Module capacity: unlimited (recommended in semester 1/3 weeks 11-13 of summer semester)

### Module level

Type of module: Teaching/Learning method

Previous knowledge:

<table>
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<tr>
<th>Examination</th>
<th>Examination times</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>End of winter semester</td>
<td>written exam</td>
</tr>
<tr>
<td>Examination</td>
<td>Examination times</td>
<td>Type of examination</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>attendance of at least 70% in the seminars (in addition, mandatory but ungraded)</td>
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<table>
<thead>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>2</td>
<td>SoSe oder WiSe</td>
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<tr>
<td>Exercises</td>
<td></td>
<td>2</td>
<td>SoSe oder WiSe</td>
<td>28</td>
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**Total module attendance time** 56 h
## Abschlussmodul

**mam - Master´s Thesis Module**

<table>
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<th>Master´s Thesis Module</th>
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<tr>
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<td>mam</td>
</tr>
<tr>
<td>Credit points</td>
<td>30.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>900 h</td>
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<tr>
<td>Applicability of the module</td>
<td>Master's Programme Biology (Master) &gt; Abschlussmodul</td>
</tr>
<tr>
<td>Responsible persons</td>
<td>der Biologie, Lehrende (Prüfungsberechtigt)</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>see examination regulations Faculty V and subject-specific annex, §20 <a href="https://uol.de/en/course-of-study/exams/biology-master-614">https://uol.de/en/course-of-study/exams/biology-master-614</a></td>
</tr>
<tr>
<td>Skills to be acquired in this module</td>
<td>Successful completion of the Master module demonstrates that students are able to work on a problem in the field of Biology within a fixed period applying scientific methods.</td>
</tr>
<tr>
<td></td>
<td>++ deepened biological expertise</td>
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<td></td>
<td>++ deepened knowledge of biological working methods</td>
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<tr>
<td></td>
<td>++ data analysis skills</td>
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<tr>
<td></td>
<td>++ critical and analytical thinking</td>
</tr>
<tr>
<td></td>
<td>+ independent searching and knowledge of scientific literature</td>
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<td></td>
<td>++ ability to perform independent biological research</td>
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<tr>
<td></td>
<td>++ data presentation and discussion in German and English (written and spoken)</td>
</tr>
<tr>
<td></td>
<td>+ teamwork</td>
</tr>
<tr>
<td></td>
<td>+ ethics and professional behaviour</td>
</tr>
<tr>
<td></td>
<td>++ project and time management</td>
</tr>
<tr>
<td>Module contents</td>
<td>Preparing the Master thesis</td>
</tr>
<tr>
<td></td>
<td>Active participation in the seminar of the research group, in which the Master thesis is written</td>
</tr>
<tr>
<td>Recommended reading</td>
<td>Supervisors may supply an initial reading list with important literature. The students are expected to find and use further literature as needed.</td>
</tr>
<tr>
<td>Links</td>
<td>English</td>
</tr>
<tr>
<td>Language of instruction</td>
<td></td>
</tr>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
<td>unlimited</td>
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<tr>
<td>Module level</td>
<td>Abschlussmodul (Abschlussmodul / Conclude)</td>
</tr>
<tr>
<td>Type of module</td>
<td>Pflicht / Mandatory</td>
</tr>
<tr>
<td>Teaching/Learning method</td>
<td>master's thesis, seminar</td>
</tr>
<tr>
<td>Previous knowledge</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td></td>
</tr>
<tr>
<td>Final exam of module</td>
<td>master's thesis (90%)</td>
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<tr>
<td></td>
<td>Final colloquium (10%)</td>
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<td>Type of course</td>
<td>Colloquium</td>
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<tr>
<td>SWS</td>
<td>2</td>
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<tr>
<td>Frequency</td>
<td>SoSe oder WiSe</td>
</tr>
<tr>
<td>Workload Präsenzzzeit</td>
<td>28 h</td>
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