<table>
<thead>
<tr>
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<th>Course Title</th>
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<tr>
<td>bio703</td>
<td>Basic Concepts in Plant Sciences</td>
<td>4</td>
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<td>bio720</td>
<td>Marine Biodiversity</td>
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<td>Biodiversity of Littoral Communities</td>
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<td>Molecular Ecology</td>
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<td>bio605</td>
<td>Molecular Genetics and Cell Biology</td>
<td>17</td>
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<tr>
<td>bio845</td>
<td>Introduction to Development and Evolution</td>
<td>18</td>
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<td>bio846</td>
<td>Lab Exercises in Development and Evolution</td>
<td>20</td>
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<tr>
<td>bio860</td>
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<td>22</td>
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<td>28</td>
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<td>neu340</td>
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<td>32</td>
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Modules for Biology

Background Modules

bio703 - Basic Concepts in Plant Sciences

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<th>Module label</th>
<th>Basic Concepts in Plant Sciences</th>
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<tbody>
<tr>
<td>Modulekürzel</td>
<td>bio703</td>
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<tr>
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<td>Workload</td>
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Verwendbarkeit des Moduls

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

Zuständige Personen

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

Prerequisites

Skills to be acquired in this module

- Communicating deeper knowledge in ecology, phylogeny, evolution and genetics of plants
- Communicating scale- and method-overarching thinking
- Communicating deeper theoretic concepts of ecology, evolution and genetics of plants.
  
- ++ 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 English (written and spoken)
- + teamwork
- ++ ethics and professional behaviour

Module contents

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 (2SWS)

Literaturempfehlungen


Links

Language of instruction

English

Duration (semesters)

1 Semester

Type of module

Wahlpflicht / Elective

Module level

MM (Mastermodul / Master module)

Teaching/Learning method

Lecture, seminar

Previous knowledge

Ecology, flora, genetics

Examination

Type of examination

1 Portfolio

Final exam of module

Prüfungszeiten

<table>
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Präsenzzzeit Modul insgesamt

112 h
**bio765 - Current Methods in Plant Sciences - Ecology, Phylogeny and Molecular Biology**

<table>
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<th><strong>Module label</strong></th>
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**Verwendbarkeit des Moduls**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Landscape Ecology (Master) > Wahlpflichtmodule

**Zuständige Personen**
- Albach, Dirk Carl (module responsibility)
- Zotz, Gerhard (Module counselling)
- Will, Maria (Module counselling)
- Khan, Gulzar (Module counselling)
- von Hagen, Klaus Bernhard (Module counselling)
- Will, Maria (Prüfungsberechtigt)
- Albach, Dirk Carl (Prüfungsberechtigt)
- Zotz, Gerhard (Prüfungsberechtigt)
- Khan, Gulzar (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
- 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**
- Current Methods in Plant Science. Subject to annual change.
- The specific topics for the coming semester will be presented at the module introduction during the orientation week, please check the community-Forum: 5.02.InfoB Informationen MSc Biology for the schedule: https://elearning.uni-oldenburg.de/dispatch.php/course/details?sem_id=d35edd038d010b56a8ae3a81e738b88&again=yes

**Literaturempfehlungen**

**Links**

**Language of instruction** | English |
**Duration (semesters)**    | 1 Semester |
**Module frequency**        | annually, winter term |
**Module capacity**         | 12 |
**Reference text**          | associated with bio703 (Basic Concepts in Plant Sciences) (recommended) |
**Type of module**          | Wahlpflicht / Elective |
**Module level**            | MM (Mastermodul / Master module) |
**Teaching/Learning method**| Exercise |
**Previous knowledge**      | Ecology, flora, genetics |

**Examination**

<table>
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**Final exam of module**

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bio655 - Ornithology in theoretical Concepts

Module label | Ornithology in theoretical Concepts
Modulkürzel | bio655
Credit points | 12.0 KP
Workload | 360 h

Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

Zuständige Personen
- Liedvogel, Miriam (module responsibility)
- Bouwhuis, Sandra (Module counselling)
- Köppl, Christine (Module counselling)
- Langemann, Ulrike (Module counselling)
- Mouritsen, Henrik (Module counselling)
- Schmaljohann, Heiko (Module counselling)
- Liedvogel, Miriam (Prüfungsberechtigt)
- Bouwhuis, Sandra (Prüfungsberechtigt)
- Köppl, Christine (Prüfungsberechtigt)
- Langemann, Ulrike (Prüfungsberechtigt)
- Mouritsen, Henrik (Prüfungsberechtigt)
- Schmaljohann, Heiko (Prüfungsberechtigt)

Prerequisites

Skills to be acquired in this module
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 smorphological 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)

Module contents
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.

Literatureempfehlungen

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


Links

Participating Institution: Institute of Avian Research für Vogelforschung


<table>
<thead>
<tr>
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<tr>
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<td>Module frequency</td>
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<td>Type of module</td>
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<td>Module level</td>
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<tr>
<td>Teaching/Learning method</td>
<td>Lecture, seminar</td>
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<td>Examination</td>
<td>Prüfungszeiten</td>
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<td>Final exam of module</td>
<td>exam during final lecture week</td>
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<tr>
<td></td>
<td>3 exams:</td>
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<tr>
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<td>- 2 presentations (20% each; the main seminar is mandatory, one of the two options need to be taken in addition)</td>
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<td>- 1 written exam or 1 oral exam (60%)</td>
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<td>Regular active participation is required for the module to be passed successfully.</td>
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Präsenzzeit Modul insgesamt 112 h
# bio770 - Field Methods in Organismal Biology

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<td>Workload</td>
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### Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Ecology (Master) > Wahlplichtmodule

### Zuständige Personen
- Zotz, Gerhard (module responsibility)
- Gerlach, Gabriele (Module counselling)
- Albach, Dirk Car (Module counselling)
- von Hagen, Klaus Bernhard (Module counselling)
- Mouritsen, Henrik (Module counselling)
- Nolte, Arne (Module counselling)
- Schmaljohann, Heiko (Module counselling)
- Will, Maria (Prüfungsberechtigt)
- Khan, Gulzar (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

### 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

### Literatureempfehlungen
Varies with topic and field locality

### Links
www.uni-oldenburg.de/fun_eco/

### Language of instruction
English

### Duration (semesters)
1 Semester

### Module frequency
annually in summer term

### Module capacity
21

### Type of module
Wahlpflicht / Elective

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

### Teaching/Learning method
Seminar, exercise

### Examination
<table>
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<td>2 Presentations (30 %) Laboratory course report on project work (70 %)</td>
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PLEASE NOTE: Additional conditions regarding attendance and ungraded activities as determined by the persons responsible for the module will apply.

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bio720 - Marine Biodiversity

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

Verwendbarkeit des Moduls:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

Zuständige Personen:
- Martinez Arbizu, Pedro Miguel (module responsibility)
- Wehrmann, Achim (Prüfungsberechtigt)
- Rossel, Sven (Prüfungsberechtigt)
- Gutt, Julian (Prüfungsberechtigt)
- Köncke, Ingrid (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 (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.

Literatureempfehlungen:
as announced in the lecture

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

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

Form of instruction:
SWS: Frequency: Workload of compulsory attendance
Lecture: 3 WiSe: 42
Exercises: 9 WiSe: 126
Seminar: 1 WiSe: 14

Präsenzzeit Modul insgesamt: 182 h
## Bio780 - Biodiversity of Littoral Communities

<table>
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**Verwendbarkeit des Moduls**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

**Zuständige Personen**
- 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
- Practising English
- Dealing with the culture of the visited region 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

**Literatureempfehlungen**
- GRÜTER, W., 2001: Leben im Meer - Vielfalt und Zusammenhänge. Dr. Friedrich Pfeil Verlag, München. % Should be read prior to a marine biological excursion! This book will arouse your curiosity about the submarine world. A reading book!
- 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.
- NYBAKKEN, J. W. & M. D. MERTNESS, 2005: Marine Biology - An ecological approach. Pearson, Education paperback book. Addison, Wesley, Publishers. % Highly illustrative! Much additional information on different fields! The authors provide a unique ecological approach that helps students understand the real-world relevance of marine biology by exploring how organisms interact within their individual ecosystems.
- Literature study: Web of science: Data banks (DBIS) – Biology – TOP data banks, e.g. ASFA, Science Citation Index, Zoological Record

**Links**
- extern http://www.biodiversitylibrary.org/bibliography/14107
<table>
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<td>Exercise, seminar</td>
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<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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**Languages of instruction**: English, German

**Duration (semesters)**: 1 Semester

**Module frequency**: annually in summer term

**Module capacity**: unlimited

**Type of module**: Wahlpflicht / Elective

**Module level**: MM (Mastermodul / Master module)

**Teaching/Learning method**: Exercise, seminar

**Final exam of module**: during the lectures

**Examination**: 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.
**bio733 - Evolutionary Biology Population Genetics**

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<td>Albach, Dirk Carl (Module counselling)</td>
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<td>Khan, Gulzar (Module counselling)</td>
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<td>Gerlach, Gabriele (Prüfungsberechtigt)</td>
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<td></td>
<td>++ data analysis skills</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>++ data presentation and discussion (E) (written and spoken)</td>
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<td></td>
<td>+ teamwork</td>
</tr>
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<td>++ statistics &amp; scientific programming</td>
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<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>
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<td>current papers in Evolutionary Biology Futuyama D. Evolutionary Biology, Elsevier, Hartl &amp; Clark Principles of Population Genetics, Sinauer</td>
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<td>Reference text</td>
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<td>Lecture, exercise</td>
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<td>Examination</td>
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<td>portfolio (presentation, laboratory protocol)</td>
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bio736 - Evolutionary Transcriptomics

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

Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules

Zuständige Personen
- 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.

Literaturempfehlungen

Links

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

Type of module: Wahlpflicht / Elective
Module level: MM (Mastermodul / Master module)
Teaching/Learning method: Lecture, exercise
Previous knowledge: Basic knowledge of evolutionary biology

Examination
Prüfungszeiten: portfolio (presentation, laboratory protocol)
Type of examination: Final exam of module

Final exam of module
Form of instruction: Comment | SWS | Frequency | Workload of compulsory attendance
--- | --- | --- | ---
Lecture | | 1 | WiSe | 14
Exercises | 3 | WiSe | 42

Präsenzzeit Modul insgesamt: 56 h


bio675 - Molecular Ecology

Module label: Molecular Ecology

Modulkürzel: bio675

Credit points: 12.0 KP

Workload: 360 h

Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Landscape Ecology (Master) > Wahlpflichtmodule

Verwendbarkeit zur Bachelorarbeit in den Studiengängen: Ja

Zuständige Personen
- Nolte, Arne (module responsibility)
- Gerlach, Gabriele (Module counselling)
- Nolte, Arne (Prüfungsberechtigt)
- Gerlach, Gabriele (Prüfungsberechtigt)
- Dennenmoser, Stefan (Prüfungsberechtigt)

Prerequisites
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.

Exercises: 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.

Literaturempfehlungen
will be announced during the course

Links

Language of instruction: English

Duration (semesters): 1 Semester

Module frequency: summer term

Module capacity: 15

Reference text: associated with bio890 Current Topics of Biology (Seminar)

Type of module: Wahlpflicht / Elective

Module level: MM (Mastermodul / Master module)

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
- Prüfungszeiten
- Type of examination
- Presentations (50%), Portfolio (50%). Regular participation is a prerequisite to pass in the module.

Form of instruction
- Comment
- SWS
- Frequency
- Workload of compulsory attendance

Lecture: 2 SWS SoSe 28
Exercises: 6 SWS SoSe 84
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### bio605 - Molecular Genetics and Cell Biology

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<td>Workload</td>
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#### Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

#### Zuständige Personen
- Neidhardt, John (module responsibility)
- Neidhardt, John (Prüfungsberechtigt)
- Koch, Karl-Wilhelm (Prüfungsberechtigt)
- Jüschke, Christoph (Prüfungsberechtigt)

#### Prerequisites
- BSc (Biologie, Biochemie)

#### 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
- + data presentation and discussion (E) (written and spoken)
- + teamwork
- + ethics and professional behaviour
- + project and time management

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.

#### Literatureempfehlungen
- Textbooks of Cell Biology

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

#### Language of instruction
- English

#### Duration (semesters)
- 1 Semester

#### Module frequency
- winter term

#### Module capacity
- 15

#### Reference text
- associated with bio900

#### Type of module
- Wahlpflicht / Elective

#### Module level
- MM (Mastermodul / Master module)

#### Teaching/Learning method
- Lecture, seminar, exercise

#### Previous knowledge
- Basic knowledge in cell biology, genetics, biochemistry

#### Examination

**Prüfungszeiten**
- written examination (70 %), paper(s) presentation 30 %; not graded: signed lab protocols, regular active participation is required for the module to be passed.

**Form of instruction**

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**Präsenzzeit Modul insgesamt**
- 112 h
bio845 - Introduction to Development and Evolution

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Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Zuständige Personen
- 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
- Neurolation
- 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
Literaturempfehlungen

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 winter term
Module capacity 20 (selection criteria: sequence of registration)
Reference text associated with bio846 (neu120) (Lab Exercises in Development and Evolution)
Type of module Wahlpflicht / Elective
Module level MM (Mastermodul / Master module)
Teaching/Learning method Lecture, seminar
Previous knowledge organismic biology, developmental biology, evolutionary biology, neurobiology, genetics, molecular biology
Examination Prüfungszeiten Type of examination
Final exam of module same winter term oral exam of 30 minutes (or written exam)
Form of instruction Comment SWS Frequency Workload of compulsory attendance
Lecture 3 WiSe 45
Seminar 3 WiSe 45
Präsenzzeit Modul insgesamt 90 h
### bio846 - Lab Exercises in Development and Evolution

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<td>• Sienknecht, Ulrike (module responsibility)</td>
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<td>• Claußen, Maike (Prüfungsberechtigt)</td>
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<td>• Ebbers, Lena (Prüfungsberechtigt)</td>
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<td>Prerequisites</td>
<td>mandatory prerequisite is the module bio845 (neu110) (Introduction to Development and Evolution)</td>
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</table>

#### 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

### Literatureempfehlungen


### Links

#### Language of instruction

English

#### Duration (semesters)

1 Semester
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<td>Examination</td>
<td>Prüfungszeiten Type of examination</td>
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### bio860 - Comparative Developmental Biology

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<td><strong>Verwendbarkeit des Moduls</strong></td>
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<td><strong>Zuständige Personen</strong></td>
<td>- Sienknecht, Ulrike (module responsibility)</td>
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</table>

#### Prerequisites

- ++ deepened biological knowledge
- ++ deepened knowledge of techniques in biology
- ++ knowledge in data analysis and presentation
- + cross-disciplinary knowledge and 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)
- + team work
- + ethics and professional behaviour
- ++ project and time management

#### Skills to be acquired in this module

- 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.

#### Literaturempfehlungen


#### Links

- English
- 1 Semester
- summer term

#### Module capacity

5 (Reihenfolge der Anmeldungen)

#### Reference text

associated with bio845 Introduction to Development and Evolution

#### Type of module

Wahlpflicht / Elective

#### Module level

MM (Mastermodul / Master module)

#### Teaching/Learning method

Lecture, exercise, seminar

#### Examination

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#### Final exam of module

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bio695 - Biochemical concepts in signal transduction

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<tr>
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<td>12.0 KP</td>
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<td>Workload</td>
<td>360 h</td>
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**Verwendbarkeit des Moduls**
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

**Zuständige Personen**
- Koch, Karl-Wilhelm (module responsibility)
- Koch, Karl-Wilhelm (Prüfungsberechtigt)
- Scholten, Alexander (Prüfungsberechtigt)
- Scholten, Alexander (Module counselling)

**Prerequisites**
- none

**Skills to be acquired in this module**
- ++ deepened knowledge of biological working methods
- ++ methods: protein expression and purification, functional assays, enzyme kinetics, spectroscopic techniques
- ++ 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
- + project and time management

**Module contents**
- Lecture: Molecular fundamentals of cellular signal processes
- Seminar: Signal transduction
- Exercises: Experiments on cellular signal transduction and enzymology

Mechanisms of biochemical signal transduction are imparted theoretically and experimentally.

**Literatureempfehlungen**
- Textbooks of cell biology and biochemistry. Current literature on topics of signal transduction (as announced in the preparatory meeting).

**Links**
- English
- 1 Semester
- winter term
- 20
- Wahlpflicht / Elective
- MM (Mastermodul / Master module)

**Teaching/Learning method**
- Lecture, seminar, exercise

**Examination**
- **Final exam of module**
  - written examination (90 minutes) (50%), protocols (50%)
  - Prerequisite for passing the module is active participation: Presentation(s) in the seminar

**Form of instruction**

<table>
<thead>
<tr>
<th>Form of instruction</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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**Präsenzzeit Modul insgesamt**
- 112 h
neu210 - Neurosensory Science and Behaviour

Module label: Neurosensory Science and Behaviour

Modulkürzel: 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

Verwendbarkeit des Moduls:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Zuständige Personen:
- Langemann, Ulrike (module responsibility)
- Langemann, Ulrike (Module counselling)
- Mouritsen, Henrik (Module counselling)
- Klump, Georg Martin (Prüfungsberechtigt)
- Mouritsen, Henrik (Prüfungsberechtigt)
- Langemann, Ulrike (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.

Literatureempfehlungen:

Links:
Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: 30

Prüfungszeiten:
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.
<table>
<thead>
<tr>
<th>Examination</th>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
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<tbody>
<tr>
<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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<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td></td>
<td>28</td>
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</table>

Präsenzeit Modul insgesamt 84 h
neu220 - Neurocognition and Psychopharmacology

Module label: Neurocognition and Psychopharmacology
Modulkürzel: neu220
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Zuständige Personen
- Thiel, Christiane Margarete (module responsibility)
- Thiel, Christiane Margarete (Module counselling)
- Thiel, Christiane Margarete (Prüfungsberechtigt)
- Gießing, Carsten (Prüfungsberechtigt)

Prerequisites
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 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 neuroscientific 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 excercise either deepens that knowledge by excersises 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

Literatureempfehlungen
Press

**Links**

**Language of instruction**
English

**Duration (semesters)**
1 Semester

**Module frequency**
jährlich

**Module capacity**
30 (Recommended in combination with neu210 "Neurosensor... 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.

**Examination**

<table>
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<tr>
<th>Form of instruction</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
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**Präsenzzeit Modul insgesamt**
56 h
### neu141 - Visual Neuroscience - Physiology and Anatomy

<table>
<thead>
<tr>
<th>Module label</th>
<th>Visual Neuroscience - Physiology and Anatomy</th>
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<tbody>
<tr>
<td>Modulkürzel</td>
<td>neu141</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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<tr>
<td></td>
<td>(3 SWS Lecture (VO)</td>
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<td></td>
<td>Total workload 90 h: 30 h contact / 60 h background literature reading and preparation for sh</td>
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<tr>
<td></td>
<td>1 SWS Seminar (SE)</td>
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<td>Total workload 30h: 10 h contact / 20 h literature reading and preparation of result presentation</td>
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<td></td>
<td>8 SWS Supervised exercise (UE)</td>
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<td>Total workload 240h: 200 h contact / 40 h results analysis, writing of short reports for portfolio</td>
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### Verwendbarkeit des Moduls
- 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

### Zuständige Personen
- 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

### Literatureempfehlungen
Course scripts and mandatory scientific literature discussed in the seminar will be available in Stud.IP.
<table>
<thead>
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<th>Links</th>
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<td>Language of instruction</td>
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<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
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<th>Type of examination</th>
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<tr>
<td>Final exam of module</td>
<td>during the course (summer semester, first half) In addition, mandatory but ungraded: seminar presentation</td>
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<tr>
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<th>Workload of compulsory attendance</th>
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<td>Seminar</td>
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<td>SoSe oder WiSe</td>
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<td>Exercises</td>
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Präsenzzeit Modul insgesamt 84 h
neu360 - Auditory Neuroscience

<table>
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<td>Modulkürzel</td>
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<td>Credit points</td>
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<tr>
<td>Workload</td>
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<tr>
<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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<td></td>
<td>2 SWS Supervised exercise (UE)</td>
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<tr>
<td></td>
<td>Total workload 90h: 10 h contact / 20 h literature search / 60 h work on essay paper</td>
</tr>
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Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Zuständige Personen
- 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.

Literatureempfehlungen
About 20 selected original papers (selection varies)
Pickles JO (2012) An Introduction to the Physiology of Hearing. Brill, Netherlands
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<thead>
<tr>
<th><strong>Links</strong></th>
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<tbody>
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<td><strong>Duration (semesters)</strong></td>
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<tr>
<td><strong>Module frequency</strong></td>
<td>annually, summer term, second half</td>
</tr>
<tr>
<td><strong>Module capacity</strong></td>
<td>15 (BM neu211 &quot;Neurosensor 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><strong>Reference text</strong></td>
<td>Registration procedure / selection criteria: StudIP, final acceptance after assignment of seminar presentation</td>
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<th><strong>Type of examination</strong></th>
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<td><strong>Final exam of module</strong></td>
<td>within a few weeks of the end of summer term lecture period</td>
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<th><strong>Frequency</strong></th>
<th><strong>Workload of compulsory attendance</strong></th>
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<td>SoSe</td>
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**neu340 - Invertebrate Neuroscience - Neurophysiology**

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<tr>
<td>Workload</td>
<td>180 h</td>
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</table>

2 SWS Seminar (SE)  
Total workload 72h: 28h contact / 44h background literature reading, preparation for short tests, portfolio assignments and results presentation  

3 SWS Supervised exercise (UE)  
Total workload 108h: 42h contact / 66h data analysis and preparation of portfolio assignments

**Verwendbarkeit des Moduls**

- Master's Programme Biology (Master) > Background Modules  
- Master's Programme Biology (Master) > Background Modules  
- Master's Programme Neuroscience (Master) > Background Modules

**Zuständigke Personen**

- 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 neurosci  
- 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

<table>
<thead>
<tr>
<th>Literaturempfehlungen</th>
<th>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</th>
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<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
<td>annually, summer term, second half</td>
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<tr>
<td>Module capacity</td>
<td>12 (this module provides the background for neu345 &quot;Neural Computation in invertebrate systems&quot;)</td>
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<tr>
<td>Type of module</td>
<td>Wahlpflicht / Elective</td>
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<tr>
<td>Previous knowledge</td>
<td>basic knowledge of neurobiology, basic MATLAB programming skills</td>
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<tr>
<td>Examination</td>
<td>Prüfungszeiten</td>
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<td>Final exam of module</td>
<td>during the course (summer term, second half) Portfolio consisting of short tests, short reports (according to portfolio assignments) and seminar presentation</td>
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<tr>
<td>Form of instruction</td>
<td>Comment</td>
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<tr>
<td>Seminar</td>
<td>2</td>
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<tr>
<td>Exercises</td>
<td>3</td>
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<tr>
<td>Präsenzzeit Modul insgesamt</td>
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</table>
neu310 - Psychophysics of Hearing

Module label: Psychophysics of Hearing
Modulkürzel: neu310
Credit points: 12.0 KP
Workload: 360 h
- 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

Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Zuständige Personen
- Klump, Georg Martin (module responsibility)
- Langemann, Ulrike (Prüfungsberechtigt)
- Beutelmann, Rainer (Prüfungsberechtigt)

Prerequisites
- Neurosci. knowlg.
- Expt. Methods
- Social skills
- Maths/Stats/Progr.
- Data present./disc.
- Scientific English

Skills to be acquired in this module
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 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.

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

Links

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

Examination
Prüfungszeiten
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

Form of instruction
Comment
SWS
Frequency
Workload of compulsory attendance
Exercises
1
SoSe
14
Seminar
2
SoSe
28
Practical training
5
SoSe
70
Lecture
SoSe
0
Präsenzzeit Modul insgesamt
112 h
Research Modules

bio900 - Biology Research Module

Module label
Biology Research Module

Modulkürzel
bio900

Credit points
15.0 KP

Workload
450 h

Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Research Modules
- Master's Programme Biology (Master) > Research Modules

Zuständige Personen
- Zotz, Gerhard (module responsibility)
- Zotz, Gerhard (Prüfungsberechtigt)
- der Biologie, Lehrende (Prüfungsberechtigt)
- der Biologie, Lehrende (Module counselling)

Prerequisites

Skills to be acquired in this module
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.

Literaturempfehlungen

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

Language of instruction
English

Duration (semesters)
1 Semester

Module frequency
winter and summer term

Module capacity
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.

Type of module
Wahlpflicht / Elective

Module level
MM (Mastermodul / Master module)

Teaching/Learning method
Project-based component

Examination
Prüfungszeiten
Type of examination
internship report

Form of instruction
Comment
SWS
Frequency
Workload of compulsory attendance
Lecture (optional)
SoSe oder WiSe
0
Seminar
1
SoSe oder WiSe
14
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<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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## bio810 - External Research Project

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<tr>
<td>Modulkürzel</td>
<td>bio810</td>
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<tr>
<td><strong>Credit points</strong></td>
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<tr>
<td>Workload</td>
<td>450 h</td>
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<td><strong>Verwendbarkeit des Moduls</strong></td>
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<tr>
<td></td>
<td>Master's Programme Biology (Master) &gt; Research Modules</td>
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<tr>
<td><strong>Zuständige Personen</strong></td>
<td></td>
</tr>
<tr>
<td></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>
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**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/pruefungsberechtigte) 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/pruefungsberechtigte), 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.

**Literaturrempfehlungen**

varies with chosen topic

**Links**

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<tr>
<th>Language of instruction</th>
<th>English</th>
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<tr>
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<td>Module frequency</td>
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<tr>
<td>Type of module</td>
<td>Wahlpflicht / Elective</td>
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<tr>
<td>Module level</td>
<td>MM (Mastermodul / Master module)</td>
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<tr>
<td>Examination/Learning method</td>
<td>Project-based component</td>
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<td>Prüfungszeiten</td>
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## bio820 - Research Module Fast Track

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<tr>
<td>Zuständige Personen</td>
<td>Klump, Georg Martin (module responsibility)</td>
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<td>Klump, Georg Martin (Prüfungsberechtigt)</td>
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<tr>
<td>Prerequisites</td>
<td>++ 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 &amp; scientific programming</td>
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### 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 in German and English (written and spoken)
- ++ teamwork
- ++ project and time management
- ++ statistics & scientific programming

### Module contents

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<th>Literatureempfehlungen</th>
<th>Links</th>
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### Examination

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<td>Form of instruction</td>
<td>Seminar</td>
<td>internship report</td>
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| SWS                                             | 1              |
| Frequency                                       | --             |
## Skills Modules

**bio870 - Communicating Plant Sciences**

<table>
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<td>Modulkürzel</td>
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**Verwendbarkeit des Moduls**

- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules

**Zuständige Personen**

- 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)

**Language of instruction**

- English

**Duration (semesters)**

- 1 Semester

**Module frequency**

- Annually, winter term

**Module capacity**

- 12

**Type of module**

- Wahlmodul / Opportunity

**Module level**

- MM (Mastermodul / Master module)

**Teaching/Learning method**

- Seminar

**Examination**

- Prüfungszeiten
- Type of examination
- Final exam of module
- 1 term paper

**Form of instruction**

- Seminar

**SWS**

- 4

**Frequency**

- WiSe

**Workload Präsenzzzeit**

- 56 h
### bio880 - Skills in Plant Systematics

<table>
<thead>
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<td>Zuständige Personen</td>
<td>Albach, Dirk Carl (module responsibility)</td>
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<td>von Hagen, Klaus Bernhard (Module counselling)</td>
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<td>von Hagen, Klaus Bernhard (Prüfungsberechtigt)</td>
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<td></td>
<td>Khan, Gulzar (Prüfungsberechtigt)</td>
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</table>

**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.

**Literatureempfehlungen**

**Links**

**Language of instruction**

- English

**Duration (semesters)**

- 1 Semester

**Module frequency**

- Winter term

**Module capacity**

- 8

**Type of module**

- Wahlmodul / Opportunity

**Module level**

- MM (Mastermodul / Master module)

**Teaching/Learning method**

- Seminar, exercise

**Previous knowledge**

- Good knowledge of native flora

**Examination**

<table>
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<th>Prüfungszeiten</th>
<th>Type of examination</th>
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<td>2 examinations: 1 presentation (50%); 1 report (50%)</td>
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**Form of instruction**

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<tr>
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<td>2</td>
<td>WiSe</td>
<td>28</td>
</tr>
<tr>
<td>Exercises</td>
<td>2</td>
<td>WiSe</td>
<td>28</td>
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**Präsenzzzeit Modul insgesamt**

- 56 h
bio890 - Current Topics in Biology

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

Verwendbarkeit des Moduls:
- Master’s Programme Biology (Master) > Skills Modules
- Master’s Programme Biology (Master) > Skills Modules
- Master’s Programme Landscape Ecology (Master) > Wahlpflichtmodule

Zuständige Personen:
- Gerlach, Gabriele (module responsibility)
- Gerlach, Gabriele (Prüfungsberechtigt)
- Laakmann, Silke (Prüfungsberechtigt)
- Beutelmann, Rainer (Prüfungsberechtigt)
- Bartölke, Rabea (Prüfungsberechtigt)
- Fleischmann, Pauline (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.

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

Links:
Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: Summer and winter term
Module capacity: unlimited
Type of module: Wahlmodul / Opportunity
Module level: MM (Mastermodul / Master module)

Teaching/Learning method:
- Seminar

Examination:
- Prüfungszeiten: Seminar
- Type of examination: open

Final exam of module:
- Final exam of module: 1 Portfolio. Components vary in the seminars. They are specified in Stud.IP in the respective seminar.

Form of instruction: Seminar
SWS: 2
Frequency: SoSe und WiSe
Workload Präsenzzeit: 28 h
neu730 - Biosciences in the Public Eye and in our Laws

Module label: Biosciences in the Public Eye and in our Laws

Modulkürzel: neu730

Credit points: 6.0 KP

Workload: 180 h
(56h contact / 84h research for presentations / 40h term paper)

Verwendbarkeit des Moduls:
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Zuständige Personen:
- Köppl, Christine (module responsibility)
- Sienknecht, Ulrike (Module counselling)

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

Upon completion of this course, students:
- 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
- Neuroenhancement
- 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.

Literatureempfehlungen

Language of instruction: English

Duration (semesters): 1 Semester

Module frequency: annually, summer term

Module capacity: 18
<table>
<thead>
<tr>
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<tr>
<td>Previous knowledge</td>
<td>Fundamentals of genetics, physiology, ecology and biological systematics</td>
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**Examination**

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<tr>
<td>Term paper</td>
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**Form of instruction**

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**Präsenzzeit Modul insgesamt**

56 h
# neu751 - Laboratory Animal Science

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<tr>
<td>Workload</td>
<td>90 h</td>
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<tr>
<td></td>
<td>(one week full-time in semester break + flexible time for studying and exam preparation)</td>
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<tr>
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<td>1 SWS Lecture</td>
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<td>total workload 45h: 2h contact / 20h background reading / 23h exam preparation</td>
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<tr>
<td></td>
<td>1 SWS Supervised exercise</td>
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<td>total workload 45h: 35h contact / 10h background reading</td>
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**Verwendbarkeit des Moduls**
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Molecular Biomedicine (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

**Zuständige Personen**
- Köppel, Christine (module responsibility)
- Köppel, Christine (Prüfungsberechtigt)
- Langemann, Ulrike (Prüfungsberechtigt)
- Winklhofer, Michael (Prüfungsberechtigt)
- Nothe, Arne (Prüfungsberechtigt)
- Heyers, Dominik (Prüfungsberechtigt)
- Ebberts, Lena (Prüfungsberechtigt)
- Dedek, Karin (Prüfungsberechtigt)
- Schmaljohann, Heiko (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, 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

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<tr>
<th>Literatureempfehlungen</th>
<th>&quot;LAS interactive&quot; internet-based learning platform</th>
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<td>Module frequency</td>
<td>semester break, every semester</td>
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<tr>
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<tr>
<td>Examination</td>
<td>Prüfungszeiten</td>
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<tr>
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<td>Type of examination</td>
</tr>
<tr>
<td>Lecture</td>
<td>immediately before the practical part</td>
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<tr>
<td>Exercises</td>
<td>written exam of 90 minutes</td>
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<tr>
<td>SWS</td>
<td>Frequency</td>
</tr>
<tr>
<td>1</td>
<td>SoSe und WiSe</td>
</tr>
<tr>
<td>1</td>
<td>14</td>
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<tr>
<td>Präsenzzeit Modul insgesamt</td>
<td>28 h</td>
</tr>
</tbody>
</table>
neu760 - Scientific English

Module label: Scientific English
Modulkürzel: neu760
Credit points: 6.0 KP
Workload: 180 h (0.5 SWS Lecture (VO)
Total workload 23h: 8h contact / 15h research for term paper
3.5 SWS Supervised exercise (UE)
Total workload 158h: 46h contact / 46h preparation of texts and presentations / 66h term paper)

Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Molecular Biomedicine (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Zuständige Personen
- Köppl, Christine (module responsibility)
- Köppl, Christine (Prüfungsberechtigt)

Prerequisites
- non-native speakers

Skills to be acquired in this module
- Neurosci. knowlg.
- Social skills
- Data present./disc.
- Scientific English

Upon completion of this course, students have increased their proficiency in different forms of scientific presentation and communication in English, with special emphasis on neuroscience.
- are able to express themselves with correct sentence structure and grammar, correct use of idioms and correct pronunciation
- are proficient in different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone)
- are able to recognize and avoid common errors of non-native speakers.

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.

Literaturempfehlungen
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

Reference text
Usually held in the break before summer term
Outsourced to STELS-OL (Scientific and Technical English Language Service); native English speaker with in-depth neuroscience knowlg.

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
Prüfungszeiten
Type of examination
Final exam of module
within 2 months of completing the course
Portfolio: 70% several quick tests, texts, presentations, 30% term paper
Bonus system for active participation
<table>
<thead>
<tr>
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<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>3.5</td>
<td>WiSe</td>
<td>49</td>
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<td><strong>56 h</strong></td>
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</table>
neu780 - Biological Data Analysis with Python

**Module label**

Biological Data Analysis with Python

**Modulkürzel**

neu780

**Credit points**

6.0 KP

**Workload**

180 h

2 SWS Lecture total workload 90h: 30h contact / 60h individual reading 2 SWS Supervised exercise total workload 90h: 45h contact / 45h solving programming exercises

**Verwendbarkeit des Moduls**

- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

**Zuständige Personen**

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

**Prerequisites**

- 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, ...

**Literaturempfehlungen**

- [open access](http://www.swaroopch.com/notes/python/)
- [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)

**Examination**

**Prüfungszeiten**

- 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

**Form of instruction**

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<tr>
<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>Exercises</td>
<td>2</td>
<td>WiSe</td>
<td>28</td>
</tr>
</tbody>
</table>

**Präsenzzeit Modul insgesamt**

56 h
neu790 - Communicating Neuroscience

Module label: Communicating Neuroscience

Module kürzel: neu790

Credit points: 3.0 KP

Workload: 90 h

(90 h (28 h contact / 62 h individual reading and preparing discussion questions))

Verwendbarkeit des Moduls:
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Zuständige Personen:
- Kretzberg, Jutta (module responsibility)
- Kretzberg, Jutta (Prüfungsberechtigt)
- Köppl, Christine (Prüfungsberechtigt)

Prerequisites:

Skills to be acquired in this module:
- 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

Literature empfehlungen:

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
<table>
<thead>
<tr>
<th>Links</th>
<th>Related content: Science communication workshop:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[<a href="https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbf">https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbf</a> a53d7b3f5e3680f52ac7d0f7](<a href="https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbf">https://elearning.uni-oldenburg.de/dispatch.php/course/overview?cid=6fc0dbbf</a> a53d7b3f5e3680f52ac7d0f7)</td>
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<tr>
<td>Module frequency</td>
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<td>Module capacity</td>
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<td>Type of module</td>
<td>Wahlpflicht / Elective</td>
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<td>Module level</td>
<td>MM (Mastermodul / Master module)</td>
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<th>Prüfungszeiten</th>
<th>Type of examination</th>
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<tbody>
<tr>
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<td>Presentation (ungraded, pass / fail)</td>
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<table>
<thead>
<tr>
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<td>SWS</td>
<td>2</td>
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<tr>
<td>Frequency</td>
<td>WiSe</td>
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<tr>
<td>Workload Präsenzzeit</td>
<td>28 h</td>
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### neu800 - Introduction to Matlab

<table>
<thead>
<tr>
<th>Module label</th>
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<tr>
<td>Modulkürzel</td>
<td>neu800</td>
</tr>
<tr>
<td>Credit points</td>
<td>3.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>90 h</td>
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</tbody>
</table>
|              | (2 SWS Supervised exercise (UE) "Introduction to MATLAB"
|              | Total workload 90h: 28h contact / 62h practising learned programming skills) |

#### Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

#### Zuständige Personen
- Gießing, Carsten (module responsibility)
- Gießing, Carsten (Prüfungsberechtigt)

#### Prerequisites

**Skills to be acquired in this module**
- ++ Expt. Methods
- + Social skills
- + Interdiscipl. knowlg.
- ++ Maths/Stats/Progr.
- + 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.

#### Literaturempfehlungen

### 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)

#### Examination

<table>
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<td>Working on exercises Regular active participation</td>
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#### Form of instruction

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<tr>
<td>Seminar</td>
<td>SoSe</td>
<td>0</td>
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<tr>
<td>Exercises</td>
<td>2</td>
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**Präsenzzeit Modul insgesamt**
- 28 h
**neu810 - International Meeting Contribution**

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<tr>
<td>Workload</td>
<td>90 h</td>
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</table>

**Verwendbarkeit des Moduls**
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

**Zuständige Personen**
- Kretzberg, Jutta (module responsibility)
- Kretzberg, Jutta (Prüfungsberechtigt)
- Köppl, Christine (Prüfungsberechtigt)

**Prerequisites**

**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.

**Literatureempfehlungen**
- dependent on the scientific topic

**Links**
- English

**Language of instruction**
- 1 Semester

**Duration (semesters)**
- every semester, flexible

**Module frequency**
- unlimited
  - please contact module organizer individually

**Module capacity**
- Wahlpflicht / Elective

**Type of module**
- MM (Mastermodul / Master module)

**Examination**
- Final exam of module
  - presentation (ungraded, pass/fail)

**Form of instruction**
- Seminar

**SWS**
- 2

**Frequency**
- SoSe und WiSe

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

Module label: Objekte in wissenschaftlichen Sammlungen: Konservierung, Management und Forschungsfragen

Modulkürzel: bio777

Credit points: 6.0 KP

Workload: 180 h

Verwendbarkeit des Moduls: 
- Master's Programme Biology (Master) > Skills Modules

Zuständige Personen: 
- Will, Maria (module responsibility)
- Albach, Dirk Carl (Module counselling)
- von Lindern, Klara (Module counselling)
- Will, Maria (Prüfungsberechtigt)
- von Lindern, Klara (Prüfungsberechtigt)

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 & digitalization)
- 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)

Literatureempfehlungen

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 frequency: Winter term

Module capacity: 10 (Lecture & seminar as a transdisciplinary course in cooperation with Fak. III)
Linked to the module bio783 "Object-based Research Projects in Biological Collections" (can be taken independently). Due to overlapping content, the module cannot be taken in addition to pb335.

<table>
<thead>
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<tbody>
<tr>
<td>Module level</td>
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<tr>
<td>Teaching/Learning method</td>
<td>Lecture, seminar, exercise</td>
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<tr>
<td>Examination</td>
<td>Prüfungszeiten</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>2 examinations:</td>
</tr>
<tr>
<td></td>
<td>- 1 written exam or 1 oral exam (100%) AND 1 practical exercise (ungraded)</td>
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</table>

<table>
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<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tbody>
<tr>
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<td>28</td>
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<tr>
<td>Exercises</td>
<td>1</td>
<td></td>
<td>WiSe</td>
<td>14</td>
</tr>
<tr>
<td><strong>Präsenzzeit Modul insgesamt</strong></td>
<td></td>
<td></td>
<td></td>
<td>56 h</td>
</tr>
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</table>
bio783 - Object-based Research Projects in Biological Collections

Module label: Object-based Research Projects in Biological Collections

Modulkürzel: bio783

Credit points: 6.0 KP

Workload: 180 h

Verwendbarkeit des Moduls:
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules

Zuständige Personen:
- Will, Maria (module responsibility)
- Albach, Dirk Carl (Module counselling)
- Will, Maria (Prüfungsberechtigt)

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

Literatureempfehlungen:
- 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:
- Linked to the module bio777 "Objects in scientific collections: Conservation, management and research issues" (independent allocation possible). The competences overlap with pb336. If module pb336 has been completed previously, admission to the module will be decided on an individual basis.

Type of module: Wahlmodul / Opportunity

Module level: MM (Mastermodul / Master module)

Teaching/Learning method: Exercise

Examination: Prüfungszeiten

Type of examination: individual

Final exam of module: 1 Portfolio
<table>
<thead>
<tr>
<th>Form of instruction</th>
<th>Exercises</th>
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</thead>
<tbody>
<tr>
<td>SWS</td>
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</tr>
<tr>
<td>Frequency</td>
<td>WiSe</td>
</tr>
<tr>
<td>Workload Präsenzzzeit</td>
<td>56 h</td>
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</tbody>
</table>
# neu820 - Neuroscience Journal Club

- **Module label**: Neuroscience Journal Club
- **Modulkürzel**: neu820
- **Credit points**: 3.0 KP
- **Workload**: 90 h (30h contact / 60h reading and preparation of oral and poster presentation)

### Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

### Zuständige Personen
- Mertsch, Sonja (module responsibility)
- Mertsch, Sonja (Prüfungsberechtigt)

### Prerequisites
- **Skills to be acquired in this module**: Students will learn to read, interpret, present and discuss neuroscientific literature.
  - ++ Neurosci. knowledge
  - + Expt. 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.

### Literatureempfehlungen
- Scientific literature will be available in Stud.IP

### Links
- **Language of instruction**: English
- **Duration (semesters)**: 1 Semester
- **Module frequency**: winter term, annually
- **Module capacity**: 20

### Examination
- **Type of examination**: Final exam of module during the semester
- **Prüfungszeiten**: Presentation and attendance of at least 70% in the seminars

### Form of instruction
- **Seminar**

### Workload Präsenzzeit
- **SWS**: 2
- **Frequency**: SoSe und WiSe
- **Workload**: 30 h
## Abschlussmodul

**mam - Master´s Thesis Module**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Master´s Thesis Module</th>
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<tbody>
<tr>
<td>Modulkürzel</td>
<td>mam</td>
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<tr>
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<tr>
<td>Workload</td>
<td>900 h</td>
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<td>Verwendbarkeit des Moduls</td>
<td>Master's Programme Biology (Master) &gt; Abschlussmodul</td>
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<td>Zuständige Personen</td>
<td>der Biologie, Lehrende (Prüfungsberechtigt)</td>
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<tr>
<td>Prerequisites</td>
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</table>

### Skills to be acquired in this module

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.

- **++** 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
- **+** ethics and professional behaviour
- **++** project and time management

### Module contents

Preparing the Master thesis

Active participation in the seminar of the research group, in which the Master thesis is written

### Literatureempfehlungen

Supervisors may supply an initial reading list with important literature. The students are expected to find and use further literature as needed.

### Links

**Languages of instruction**

English, German

**Duration (semesters)**

1 Semester

**Module frequency**

semiannual

**Module capacity**

unlimited

<table>
<thead>
<tr>
<th>Examination</th>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>master's thesis (90%)</td>
<td>Final colloquium (10%)</td>
</tr>
</tbody>
</table>

### Form of instruction

Seminar

### SWS

2

**Frequency**

SoSe und WiSe

**Workload Präsenzzeit**

28 h