Sommerpraktika 2024 (5 ECTS), 2. Studienjahr Biologie

Was ist das Sommerpraktikum (SPR)?

- Eine Wahlveranstaltung zu **5 ECTS**. (Es wird KEIN Lohn entrichtet!)
- Durchführung als **Blockkurs** zu **3 Wochen** (Mo-Fr)
- Durchführung nur im Sommer, vorzugsweise in Kalenderwochen 27 bis 34 / Anfang Juli bis Mitte August (vorher und nachher finden Prüfungen statt)
- Anrechenbar nur für zweites Studienjahr Biologie (Modul 2F, Studienplan Biologie 2021)
- Nur für Major-Studierende
- Individuelle Aufgaben in den Forschungsgruppen, Betreuung durch Assistierende
- 5 ECTS entsprechen einem zeitlichen Arbeitsaufwand der Studierenden von ca. 125 Stunden.

Anmeldung
Interessierte Studierende melden sich von Montag, 2. Oktober 2023 (ab 12:30 Uhr) bis 31. Oktober 2023 (23:55 Uhr) auf der ILIAS Plattform an. (Die Anmeldung ist eine ILIAS-Umfrage.) Dabei geben sie 3 unterschiedliche Prioritäten bezüglich Forschungsgruppe an. Die Plätze werden nach dem Prinzip „first come – first served" vergeben.

https://ilias.unibe.ch/goto_ilias3_unibe_svy_2855098.html
(Am besten zuerst mit Campus Login in ILIAS-Umgebung einloggen, erst dann Link zur Anmelde-Umfrage anklicken)

Bewertung
Das SPR wird mit bestanden / nicht-bestanden bewertet. Es wird kein schriftlicher Bericht verlangt.

Voraussetzungen zur Teilnahme
Studierende, die ein SPR absolvieren möchten, müssen vor Antritt des Sommerpraktikums …

- das erste Studienjahr Biologie abgeschlossen und bestanden haben.
- 4 Semester Biologie absolviert haben.
- mindestens 90 bestandene ECTS im Biologiestudium vorweisen.

Angebot für Sommer 2024 - Übersicht

Gruppe	maximale Anzahl Plätze
Eric Allan (IPS)	4
Raphael Arlettaz (IEE)	3
Matthias Erb (IPS)	3
Carmen Faso (IZB)	2
Peter Meister (IZB)	3
Torsten Ochsenreiter (IZB)	2
Catherine Peichel (IEE)	1
Michael Raissig (IPS)	2
Doris Rentsch (IPS)	1
Eva Ringler (IE)	1
Madhav Thakur (IEE)	3

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Ausschreibungen der Forschungsgruppen:

Eric Allan (IPS)

Our community ecology group works on two interlinked questions: what maintains diversity within plant communities? And what effects do changes in community diversity have on the functioning of ecosystems and the services they provide? We try to understand the biodiversity of plant communities from several different angles and we do experiments in the field and greenhouse and use statistical modelling to test these questions in large datasets.

For this summer practical, students will work on a large field experiment our group has established in Münchenbuchsee. Here we manipulate biodiversity, plant functional composition, nitrogen addition and pathogen exclusion, to test different mechanisms by which biodiversity affects ecosystem functioning. We also use the experiment as a platform to test for linkages between plant and insect diversity, effects of plant diversity on soil organisms and to explore coexistence mechanisms between plant species (for more details see https://allanecology.com/projects/). The student will collaborate closely with PhD students and postdocs working in this experiment and will be introduced to a range of key field methods in biodiversity research, including plant functional trait and community measures, soil and insect sampling and ecosystem function measurements. The student will also gain insight into experimental design and current approaches in biodiversity research.

Raphael Arlettaz (IEE)

The Conservation Biology group conducts applied research in farmland, woodland and high altitude ecosystems: mechanisms responsible for ecosystems degradation and species decline are investigated so as to provide sound mitigation measures and restoration solutions for biodiversity.

Low-intensity grasslands – We conduct controlled experiments on alternative management regimes for hay meadows, with the objective to deliver more biodiversity-friendly agri-environmental schemes for sustaining fundamental agro-ecosystem processes and services.

Small structures – We try to determine quantitatively which species (in particularly stoats, least weasels and reptiles) are favored by the presence of piles of branches or stones and to better understand the role of these small structures on the functionality of agroecosystems (e.g. as a stepping stone for animal dispersal).

Conservation planning – We strive to ensure our species and ecosystems research directly improves biodiversity policies. Using both qualitative and quantitative methods, we work directly with managers to predict the outcomes of different management choices, then optimize them against other ecological, social and economic constraints to recommend rational conservation actions.

Other projects can also accommodate students on demand:

http://www.cb.iee.unibe.ch/studies/summer_practical_spr/index_eng.html

Matthias Erb (IPS)

Die Bedeutung von Abwehrstoffen für die Pflanzenresistenz und das Verhalten von Schädlingen in landwirtschaftlichen Systemen

Unsere Arbeitsgruppe erforscht wie sich Pflanzen gegen Schädlinge zur Wehr setzen und wie sich diese Abwehrmechanismen auf das Verhalten der Schädlinge auswirken. Unsere Versuche verbinden Laborstudien mit Feldexperimenten mit dem Ziel, die Interaktionen vom Gen bis zum Agroökosystem zu verstehen und so die wissenschaftlichen Grundlagen für eine Nachhaltige Nahrungsproduktion zu schaffen. In unserem Sommerpraktikum helfen die Studenten mit, die Interaktion von Pflanzen und Schadinsekten zu charakterisieren, Pflanzenmaterial zu sammeln, Pflanzenproben im Labor zu extrahieren und pflanzliche Abwehrstoffe zu analysieren. Die Studenten erhalten die Gelegenheit, die gewonnenen Daten zu analysieren und die Resultate zu interpretieren.

Carmen Faso (IZB)

Our group focuses on the cell biology of parasitic protists, with a focus on secretory mechanisms at the host-pathogen interface at the basis of virulence factor release. We offer practical training in molecular biology, cell biology, protein identification, cell culturing and microscopy. The selected applicant will work alongside either a MSc or PhD student, depending on their choice of project.

Peter Meister (IZB)

Our laboratory is interested in epigenetic gene regulation, in particular how genome folding impacts on genome expression. In each human cell, two meters of DNA are packaged in a five micrometers diameter sphere. To scale, this is equivalent to a wire from Geneva to Zürich folded into a basketball. Despite this high level of compaction, the nucleus is able to maintain a transcriptional program, *e.g.* spatially segregate active from inactive genes. This program is the molecular basis for cell fate and we explore how nuclear organization maintains cell identity – a major question in regenerative medicine and cancer biology. Our model system is the nematode *C. elegans*, using a combination of molecular, genetic (CRISPR/Cas9), live microscopy (3D STED) and high-throughput (sequencing and screening) approaches.

During this practical, the student will be able to learn basic genetic crosses, PCR screening, high-resolution microscopy as well as advances molecular biology techniques. They will participate actively to one of the ongoing projects in the laboratory.

Torsten Ochsenreiter (IZB)

We are interested in understanding molecular mechanisms of organelle biogenesis and cell differentiation. Our model system is the single celled human and animal parasite *Trypanosoma brucei*. There are several compelling reasons to study trypanosomes: (i) they are important human and animal pathogens (ii) they are early branching eukaryotes with diverse molecular pathways and are (iii) easy to study in the laboratory setting.

Each student will be supervised by one PhD student. Depending on the individual projects, the student will be able to get insights into molecular biology techniques including: cloning, PCR, northern, biochemical methods like western blotting, protein purification, fluorescent microscopic imaging, FACS and cell culture.

Catherine Peichel (IEE)

Research in our group is currently focused on addressing two broad questions in evolutionary biology: (1) How and why does the genome evolve?; (2) What is the genetic and genomic basis of adaptation and speciation? We combine molecular, developmental, genetic and genomic approaches in the lab with evolutionary and ecological studies in the field to understand both the proximate mechanisms (i.e. molecular, developmental, genetic and genomic) and the ultimate causes (i.e. selective forces) that lead to the spectacular phenotypic diversity we observe in nature. Most of our research uses various species of stickleback fish as a model system.

During this practical, the student will work closely with a postdoctoral fellow or a PhD student in the group on an ongoing research project that is tailored to the specific interests of the student. Most research projects will provide hands-on training in at least one of the following areas: molecular biology, microscopy, phenotypic analyses, bioinformatics and sequence analyses, and/or fieldwork. In addition, students will receive guidance and experience in designing experiments, analyzing data, presenting results, and discussing scientific research.

Michael Raissig (IPS)

Plants need to "breathe", too - form, development, and function of grass stomata

Plants use sunlight to turn carbon dioxide (CO2) and water into the sugars we eat and the oxygen we breathe. To take up CO2 from the atmosphere land plants form microscopic "breathing" pores on their leaves, which are made up of two guard cells that can open and close and are called stomata (Greek for "mouths"). Land plants have evolved different stomatal morphologies with different gas exchange efficiencies. For example, grasses like rice, maize and wheat recruit two lateral subsidiary cells (or "helper cells") that support the central guard cells to open and close faster. This helps grasses to be more water use efficient because open stomata not only take up CO2 but also release water vapor.

Our lab wants to understand (1) how the superior grass stomata develop, (2) how their innovative form supports fast opening and closing, and (3) if we can engineer stomatal form to improve water use efficiency and stress resilience. To this end, we use CRISPR/Cas9 gene-editing, (time-lapse) confocal microscopy, (single-cell) transcriptomics, and leaf-level gas exchange measurements. We work with the genetic model grass Brachypodium distachyon–a wild relative of wheat and barley–which we can transform efficiently using embryonic tissue culturing. Different projects are available that primarily use imaging, molecular biology, or physiological methods depending on the interest of the summer student.

Doris Rentsch (IPS)

Stickstoff ist für das Wachstum und den Ertrag von Pflanzen essentiell und wird unseren Kulturpflanzen in der Regel in Form von Dünger zugeführt. Die übermässige oder falsch abgestimmte Verwendung von Dünger führt jedoch zur Auswaschung v.a. von anorganischem Stickstoff und damit unter anderem zu Beeinträchtigungen anderer Ökosysteme. Wir untersuchen inwieweit organischer Stickstoff für die Ernährung der Pflanze wichtig ist und wie dieser in Samen oder Früchte transportiert wird. Dazu verwenden wir ein breites Spektrum an Methoden (Molekularbiologie, Zellbiologie, Biochemie, Physiologie, etc.).

Der/die Praktikant/in arbeitet an einem aktuellen Forschungsprojekt mit, und hilft z.B. DNA zu isolieren, mittels PCR (transgene) Pflanzen zu identifizieren, oder Gehalte an Metaboliten zu bestimmen.

Voraussetzung: Interesse an Pflanzenphysiologie und molekularen Methoden, Englischkenntnisse.

Eva Ringler (IEE)

Spatial learning in Tokay geckos - We recently established the gecko cognition lab as part of the Division of Behavioural Ecology. We study cognition in relation to parental care and sociality using the Tokay gecko (*Gekko gecko*) as a model species. These geckos originate from South-East Asia and perform parental care that leads to short term group living. In Summer 2023, we plan to run a large spatial learning experiment using the radial arm maze to study spatial learning, reference and working memory in adult geckos. We are looking for a student interested in studying spatial cognition in a standardized lab test. The work will include performing the experiments and scoring the videos produced.

Molecular parentage assignment in glassfrogs and poison frogs - We currently have two ongoing projects to study reproductive ecology in poison frogs (*Allobates femoralis*) and glassfrogs (*Hyalnobatrachium valerioi*). In order to identify parentage of adult frogs and tadpoles as well as to establish cross-generational pedigrees we genotype all individuals at multiple microsatellite loci. In Summer 2023 we will extract DNA from tissue samples, perform multiplex PCRs, and sequencing. We are looking for a motivated student to assist with the molecular (and eventual bioinformatic) work.

Madhav Thakur (IEE)

Our research group is interested in understanding how climate extremes, such as heat waves and prolonged drought periods affect the biodiversity of terrestrial ecosystems. To address this, we perform ecological experiments with soil microorganisms, soil invertebrates and grassland plants. One of our main research themes in these experiments is to examine how biotic interactions (e.g., competition, predation or mutualism) can explain both the response of organisms during a climate extreme event, and their recovery after the climate extreme event is over.

For this practical, we currently have three independent projects for students. 1) Work with soil invertebrates (e.g. Collembola and mites) in one of our experiments, where we collect communities of soil invertebrates from different elevations in the mountains, and later expose them to heat waves to measure their response and recovery. 2) Work with arbuscular mycorrhizal fungi (amf) from experiments where we are examining how plant-amf mutualism in native and invasive plants during extreme drought events may differentially affect plant recovery after the extreme drought. 3) Work with various species of saprotrophic fungi to examine their responses to combined effects of nutrient pulse and extreme heat events to link how fungal-fungal interactions help us understand soil fungal biodiversity in a changing world.

By participating in either of the three above projects, a student will learn: 1) how ecological experiments are performed in global change contexts, 2) how various organismal traits are measured, 3) how data is visualized in scientific research, 4) how collaborative projects are performed.