Research topics in Ecology and Evolution

Vrije Universiteit Amsterdam

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Note to students:

This document provides information about potential VU supervisors for Research Projects and Literature theses within the MSc Ecology & Evolution program at the Vrije Universiteit.

Each page describes the general research interests of the different scientific staff members in section Systems Ecology and section Ecology & Evolution. In some cases there are also examples of recently supervised projects, and ideas for future project topics.

Please use this document as a starting point to help you decide who you might like to work with. Do not feel limited by the topics described here. Most staff members are happy to discuss alternative project ideas related to their research interests.

Feel free to contact staff members directly – the best method for this is a brief email with a clear request. Bear in mind that most staff members receive more emails than they can reply to in a day, so if you do not receive a reply within a week, a (polite) reminder email is always OK.

Note that for the first research project **you have to work with a research group either at the VU A-LIFE sections Systems Ecology and Ecology & Evolution OR a research group at UvA-IBED** https://ibed.uva.nl/

For the second research project and literature thesis it is allowed to work with any scientific group worldwide (see manuals for more detailed considerations).

For every project, internal and external, a **VU supervisor** has to be involved to act as the official examiner. The staff members in this document can all act as VU supervisors.

Questions? Refer to the research project and literature thesis manuals available on Canvas, and if there are still doubts contact Internship Coordinator James Weedon, james.weedon@vu.nl

Sebastiaan Luyssaert

Research theme:

My research takes the lead in extending the capacity of the internationally recognized land-surface model ORCHIDEE and the coupled land-atmosphere model LMDzOR to simulate the biogeochemical and biophysical pathways of forest management and natural disturbances that affect the climate system. My work relies on observation-based syntheses that bring together data on carbon cycling in forest ecosystems, original analysis of the interplay between albedo, evapotranspiration and sensible heat flux, the large-scale impacts of forest management on stand structure, and reconstructing forest management in Europe.

Research keywords:

- ecosystem modeling
- forestry
- Climate

Potential project topics:

- Role of disturbances in the Earth system
- Role of shrubs in the Earth system
- Importance of forest edges in the Earth system

Recently supervised research projects:

- Interactions between episodic droughts and bark beetle outbreaks: a modelling study
- Evaluating the capability of the land surface model ORCHIDEE: simulating storm damage in the Eastern United States
- Using cavitation as a proxy to simulate drought-induced tree mortality in ORCHIDEE
- Simulating plant density under semi-arid climates

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Katrin Fleischer

Research theme:

I study the ecology and biogeochemistry of tropical forest ecosystems, which have evolved over millennia into biologically and physically diverse ecosystems with unique functionality but now face multiple human-caused threats. I work to quantify the cycling of the major elements, carbon, nitrogen, and phosphorus, and how plant-soil-microbial interactions have established to efficiently cycle scarce elements such as phosphorus. Process-based land models, plant trait databases, forest field inventories and ecosystem manipulation experiments are methods and resources over which I integrate to better the representation of tropical ecosystems in Earth System Models. I am involved in the development of the land surface model ORCHIDEE (https://orchidee.ipsl.fr/), the tropical forest experiment AmazonFACE (https://amazonface.unicamp.br/), and the tropical forest inventory network RAINFOR (https://rainfor.org/en/). Student projects offer opportunities to be involved in ongoing research through modelling, data synthesis, and model-data integration and contribute to the understanding of tropical forest resilience to climate change.

Research keywords:

- Ecosystem modelling
- Tropical forest ecology
- Carbon, nitrogen, and phosphorus cycling
- Plant-soil-microbe interactions and traits

Potential project topics:

- Climatic and soil edaphic control on tropical forest productivity
- Modelling elevated CO_2 effects in a tropical forest experiment
- Plant and soil microbial traits control on biogeochemical cycling

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James Weedon

Research theme:

My research seeks to understand the biotic controls of terrestrial biogeochemical cycles, particularly of carbon and nitrogen. I am focused on below-ground processes and have conducted research into how plant traits affect the rates of plant litter decomposition, the role of microorganisms in soil nitrogen cycling, and the interactions between phenology of vegetation and the seasonality of microbial communities and associated biogeochemical transformations. An emerging research interest is defining appropriate statistical models for high-throughput sequence data from environmental sequencing efforts, and techniques for quantifying and propagating uncertainty in ecosystem models.

Research keywords:

- terrestrial biogeochemistry and nutrient cycling
- soil microbial ecology
- plant-microbe interactions
- ecological modelling
- ecological statistics

Recently supervised research projects:

- Identifying strigolactone exudation changes due to domestication in the legume-microbe communication system under phosphorus deprivation
- Isolation and characterization of arbuscular mycorrhizal fungi from salt-effected soils
- Multiple mutualistic effect on plant performance of annual legumes
- Effects of soil warming on temperature sensitivity of Arctic soil bacterial communities

Potential project topics:

- Biotic and environmental controls of soil organic matter and plant litter decomposition
- Searching for salt-tolerant AMF (with Vasilis Kokkoris)
- Model-data integration for quantifying uncertainty in ecosystem process projections

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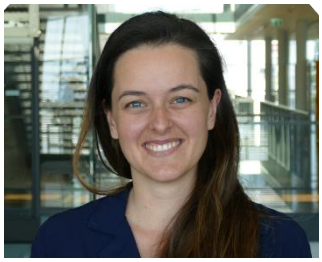

Aileen Berasategui

Research theme:

I am interested in the genomic and chemical aspects underlying the evolution of symbiotic interactions. Particularly, I aim to understand how widespread insect-fungal mutualisms are and how they are established and maintained. Through a combination of genomics, transcriptomics, bioassays and analytical chemistry I characterize the molecules mediating these interactions. I also explore their resilience to rapid changes in abiotic factors and what their evolutionary responses are to a rapidly changing world. While I am intrigued by a diversity insect-fungal symbioses, most of my research focuses on tortoise leaf beetles and their associated fungi.

Research keywords:

- Insect-microbe symbioses
- Plant-microbe-insect interactions
- Fungal ecology
- Evolutionary genomics
- Secondary metabolites

Potential research topics:

- The genetic basis of antimicrobial compound production in leaf beetles.
- Defense against entomopathogens in a fungal-beetle symbiosis.
- Genome editing in *Escovopsis*, a fungal parasite of leaf-cutter ant gardens.
- Propagation of an insect-associated phytopathogen to naive host plants.
- Effect of simulated climate change on life history traits in the tortoise leaf beetle *Chelymorpha alternans*.

Potential literature reviews:

- Ecology and evolution of ambrosia gall midges-fungal symbioses.

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Stef Bokhorst

Research Theme

I am interested in the interplay between plants and soil animals and how they affect ecosystem processes. In particular, the role of plant growth forms and their impact on soil characteristics and climate are highly relevant for soil animals. The impact of climate change on these interactions and processes plays a dominant role in most of my work. In particular, the simulation of warming events during winter (in northern Scandinavia) and year-round climate warming in the Antarctic. Currently I am working with colleagues on mapping and understanding the distribution and biodiversity of Antarctic biota along the Antarctic Peninsula. Within the project there are multiple opportunities to study cryptogam ecology and physiology.

Research keywords:

- Climate extremes
- Plant-soil interactions
- Microarthropod ecology
- Trait ecology
- Cryptogams

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Potential project topics:

Climate change impacts

Climate warming influence on moss associated nitrogen fixation rates

The bipolar moss *Sanionia uncinata* can contribute to nitrogen inputs in Arctic ecosystems through its microbiome, but how its activity responds to temperature is unclear. How does nitrogen fixation associated with *S. uncinata* from the Arctic and the Antarctic (and potentially a temperate region) respond to a temperature increase? Contact Ingeborg Klarenberg email: i.j.klarenberg@vu.nl

Extreme events in sub arctic

How do extremes of summer drought and winter frost affect the growth of artic plants and their role in the carbon balance of peat and tundra ecosystems? A lot of opportunities to study different aspects of soil-plant components of artic ecosystems. Contact Stef Bokhorst email: s.f.bokhorst@vu.nl

Biotic interactions

Bird influence on nitrogen fixing activity

Nitrogen is limited in Antarctic terrestrial ecosystems, except where penguins bring nutrients from sea to land. But mosses hosting nitrogen-fixing bacteria are also potentially important contributors to nitrogen inputs in Antarctic terrestrial ecosystems. How do the presence of penguin colonies, moss habitat and temperature influence their nitrogen-fixing activity? Contact Ingeborg Klarenberg email: i.j.klarenberg@vu.nl

Cryptogam influence on plant germination

How do mosses influence seed germination of vascular plants? Mosses create their own micro-habitat which can slow down or speed up seed germination of vascular plants. However, the mechanisms through which mosses do this, is unclear; is it related to temperature, moisture or a chemical component? Contact Stef Bokhorst email: s.f.bokhorst@vu.nl

Trait ecology

Trait variation among mosses and lichens

Intra- and interspecific trait variation of mosses and lichens can influence associated biodiversity and ultimately ecosystem functioning, but to which degree do traits such as water holding capacity and C:N ratio vary between and within Antarctic moss and lichen species? Contact Ingeborg Klarenberg email: i.j.klarenberg@vu.nl

What is a population? Biogeographic patterns among Antarctic springtails

One island, one population of the Antarctic springtail *Cryptopygus antarcticus*? Using the mitochondrial COI gene to explore if a small icecap has influenced biogeographic patterns of the springtail *C. antarcticus* on Signy Island in the maritime Antarctic. Contact Ingeborg Klarenberg email: i.j.klarenberg@vu.nl

Ancient DNA vs traditional biomarkers

Antarctic moss banks can serve as biological and climatological archives by quantifying for instance testate amoebae populations and stable isotopes. How does ancient DNA compare to traditional biological markers using moss cores from *Chorisodontium aciphyllum* banks on Signy Island? Contact Ingeborg Klarenberg email: i.j.klarenberg@vu.nl

Literature thesis topics

-How do species traits related to cryptogam physiology differ across and within functional groups?

Joris M. Koene

Research theme:

My research revolves around simulteanously hermaphroditic reproduction, including sexual conflict and sperm competition, with the aim to integrate findings into a complete and general picture of why and how sexual selection works in such animals. Recent projects focussed on socially transferred materials (a.k.a. allohormones) that are produced by accessory glands and transferred during mating, via semen or love darts. I use the model species *Lymnaea stagnalis* (Great pond snail) as well as dart-shooting land snails (e.g., *Cornu aspersum*, *Cepaea nemoralis*). I integrate different biological levels (e.g., behaviour, evolution, ecology, physiology, neuro-endocrinology) and use a range of different techniques.

Research keywords:

- Accessory gland proteins
- Behaviour
- Hermaphroditism
- Socially transferred materials
- Sexual selection

Recently supervised research projects:

- The effects of seminal fluid proteins on inbred lines of *Lymnaea stagnalis*
- Identifying and visualizing seminal fluid proteins in *Lymnaea stagnalis*
- Ginger snails: mode of shell colour inheritance and heat tolerance
- The effect of urbanization on reproductive morphology in the grove snail *Cepaea nemoralis*

Potential research topics:

- The effect of temperature on shell growth of *Lymnaea stagnalis*
- The effects of Inbreeding on pond snail mating behaviour
- Identifying and visualizing seminal fluid proteins in *Lymnaea stagnali*s

Potential literature reviews (including options for Communication and Science, Business and Innovation students):

- Commonalities in socially transferred materials
- The history and scientific impact of snail research at the VU since the 60s
- Extensive competitive analysis of the use of 3D anatomical models in teaching

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Mirte Bosse

Research theme:

My research interest lies in the novel field of conservation genomics. I build my expertise in population and conservation genomics in wildlife and livestock. My work focuses on the use of genome sequences to obtain insight into the history and potential future of populations. I am particularly interested in understanding how demographic fluctuations, hybridization and selection shape patterns of genetic diversity along the genome, and how we can use sequence-derived information to facilitate conservation management. I have analyzed and fine-tuned sequence-derived measures of genetic health and diversity in multiple livestock populations, especially chicken and pigs, and now apply them to endangered species such as warty pigs, elephants and baboons.

I am fascinated by the story about our history that is written in our DNA. Reading the genome as a history book reveals a wealth of information about the past – but also holds promises for the future. I gladly share my fascination about genomics research to a broader, non-scientific audience through public lectures, news items, videos, workshops, my membership of BWM and other means.

Research keywords:

- Conservation genomics
- Population genetics
- Inbreeding and genetic load
- Whole genome sequence
- Zoo animals

Recently supervised research projects:

- Genomic insights into Red Panda conservation: genetic health and lineage of European zoo population
- Genetic diversity and population structure in subspecies of the Asian Elephant
- How "loaded" are the genomes of Danish wild boars?
- Do endangered species have eroded genomes?
- Inteelt bij mantelbavianen (Papio hamadryas) in dierenparken van Nederland

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Katja Hoedjes

Research theme:

Adaptation of organisms to environmental conditions depends on the evolution of a wide range of phenotypes that jointly determine Darwinian fitness. Rapid technological advances in "omics" technologies in the past decades have provided unprecedented possibilities to explore the genetic basis of these adaptive traits. These analyses have revealed that most adaptive traits have a complex genetic basis that depends on many genetic loci that can interact with each other. Predicting such complex traits from genotype information, therefore, remains one of the biggest challenges in Biology to date.

With our group, we aim to understand how individual genetic variants contribute to the evolution of adaptive phenotypes. We hereby focus on two main model systems (1) the balance between ageing and reproduction in the fruit fly *Drosophila melanogaster*, and (2) memory formation in parasitic wasps of the genus *Nasonia*. To study these the genotype-to-phenotype map of these traits, we integrate principles and techniques from the fields of life history evolution, experimental evolution, population genetics, genomics, bioinformatics, behavioural ecology, neurobiology, and functional genetics, including the application of genetic tools such as RNAi and CRISPR/Cas9.

Research keywords:

- Aging and life history evolution
- Learning & memory formation
- Functional genetics
- Population genomics
- Functional prediction & bioinformatics
- Fruit flies & parasitic wasps

Potential research topics:

- Various projects within our research lines on life-history evolution in the fruit fly; e.g. generating or characterizing CRISPR/Cas9 edited lines, population genomics analysis of natural fly populations, etc. (BSc + MSc)
- Using insect biosensors for food flavor development (co-supervised with dr. Herwig Bachmann: In this project, we aim to use the parasitic wasp *Nasonia vitripennis* as a biosensor for the detection of specific microorganisms that are used in the fermentation process of

plant-based products that are currently under development to offer an alternative to dairy products. For example, the concentration of aldehydes, alcohols and ketones, produced by microorganisms is critical for a positive sensory perception and, hence, acceptance of these products by human consumers. For this, we need to be able to screen large number of odor and taste profiles produced by different strains of microorganisms. (MSc only)

Recently supervised research projects:

- Single nucleotide polymorphism in *Eip75B* influences the female fecundity of *Drosophila melanogaster*
- Phenotypic effect of RNAi knock down of all three paralog *fas* genes in *Nasonia vitripennis*
- CRISPR-CAS9 precise genome editing to assess single nucleotide variation

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Mariet Hefting

Research theme:

In my research I delve into the microbial conversions of carbon and nitrogen in organic soils. I study associated greenhouse gas emissions in the context of climate change and eutrophication. My objective is to understand the factors that determine soil organic matter resistance to microbial decomposition and how we can use these insights in mitigation measures to turn agricultural and natural peatland ecosystems into carbon sinks. My research draws from soil science, biogeochemistry, ecology, and hydrology. My approach encompasses conceptual and experimental research, fieldwork, and laboratory measurements.

Research keywords:

- Biogeochemistry and nutrient cycling
- Soil organic matter dynamics
- Greenhouse gas emissions
- Peat oxidation
- Land subsidence

Recently supervised projects:

- Assessing the impact of saline clay amendments for peat decomposition mitigation in drained dairy meadow peats.
- The influence of substrate quality on the respiration rate of peat soils
- The role of phenol oxidase in anerobic peat degradation

For more information about peatland research projects, please visit:

https://nwa-loss.nl/werkpakketten/wp2-mechanismen-en-broeikasgasemissies/wp2-1-de-rol-van-microbiele-afbraak-bij-veendaling/
https://www.nobveenweiden.nl
https://vip-nl.nl

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Jacintha Ellers

Research theme:

My research studies evolutionary responses of organisms to environmental change. My aim is to understand the evolution and diversity of traits by integrating molecular, physiological, and experimental tools. My current research focuses on (i) adaptive evolution of traits under anthropogenic environmental change (urbanization, climate change, invasive species); and (ii) the evolutionary trajectories that govern species interactions. I mostly use invertebrate model species in the lab (parasitoid wasps, housefly, Drosophila) as well as a wider range of organisms for studies of wild populations (beetles, plants, lizards). I am also interested in applying the trait-based approach to restore ecosystem biodiversity and the socio-economic benefits that healthy ecosystems provide.

Research keywords:

- Genome evolution & trait loss
- Evolution of lipid functions
- Invasive species
- Urban adaptation

Recently supervised research projects:

- The effect of fas1 knockdown on tissue-specific expression of lipid metabolism genes
- Variation in physiological traits of isopods from urban and rural habitats
- Predicting coexistence outcomes between resident and invading gecko species on Curaçao.
- Analysis of Climate-Change Denialism on Twitter in the Context of the Australian Fires

Potential research topics:

- Understanding the multiple functions of fatty acid synthesis in parasitoid wasps
- Changes in biodiversity across the urban-rural gradient and effects on species interactions.
- Meta-analysis of trait diversity: possibility for different questions regarding the thermal sensitivity of fecundity and/or development using and expanding the ShareTrait database.

Potential literature reviews

- Evaluating the effectiveness of nature-based solutions for increasing ecosystem health and socio-economic benefits

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Matty P. Berg

Research theme:

- I'm a field ecologist and naturalist. What spurs me on is the question of what determines the diversity, composition, functioning and adaptation of (soil fauna) communities to environmental stress, such as nitrogen deposition, extreme climatic events and intensive land-use. I study how changes in species composition (via response traits) affect important ecosystem processes (via effect traits), such as soil and vegetation structure and litter decomposition. My research emphasizes a mechanistic approach, linking species functional traits to community composition and ecosystem functioning in a variety of study systems, including green beach, salt marsh, peat meadow, savanna and sub-arctic tundra. I use a variety of model organisms, including ecosystem engineers, such as bioturbating earthworms, landhoppers and termites, detritivores like Collembola and terrestrial Isopoda, and predators such as carabid beetles. I also develop trait databases.

Research keywords:

- Functional traits
- Community composition
- Ecosystem engineers
- Nitrogen, climate change and land-use transition

Recently supervised research projects:

- The effect of peat meadow riparian zone types on vegetation, earthworm and carabid beetle species and trait composition.
- Variation in physiological traits of isopods and millipedes across dry-wet landscape gradients.
- Influence of height above sea level and associated environmental factors on yellow ant mound distribution across salt marshes.
- Analysis of land-use intensity of peat meadows on changes in biodiversity, and development of biodiversity indicators.

Potential research topics:

- The above plus...
- Understanding the impact of land-use intensity on biodiversity of peat meadows.
- Understanding the impact of a rise in water levels on peat meadow biodiversity.
- Understanding changes in biodiversity across the urban-rural gradient and effects on species composition, using functional traits.
- Analyzing trade-offs between functional traits related to multiple environmental stressors.

Potential literature reviews

- Evaluating the effectiveness of fitness traits to understand shifts in species composition across rural-to-urban environmental gradients.
- Evaluating the impact of using brackish water to overcome summer drought on plant and soil biodiversity of peat meadows.
- Evaluating the effectiveness of pressure drain vs ditch infiltration on soil biodiversity.

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- Website: Matty P. Berg – Amsterdam Ecology

Hans Cornelissen

Research theme:

I am interested in the role of functional trait variation in plant and ecosystem functioning, with a particular focus on how vegetation composition impacts on carbon and nutrient cycling. I like to find out not only what determines the functional composition and diversity of plants in ecosystems, but also how (much) this functional composition drives important ecosystem processes. These processes include plant carbon and nutrient gain processes (photosynthesis, nutrient uptake strategy) but especially carbon and nutrient loss processes, such as litter decomposition, fire and herbivory. I study linkages between traits and carbon cycling through lab and field experiments, trait database analyses and meta-analyses, from local to global scale. In these studies, which are done in various biomes in the world, my pet organisms include higher plants, mosses and lichens. Furthermore, I study evolutionary patterns in ecosystem processes: the Tree of Life of carbon cycling. This approach helps us to reconstruct carbon cycling in the past. In the fire lab, FLARE, we carry out ecological fire experiments. I also coordinate the large 'tree cemetery' experiment, LOGLIFE, on tree trait effects on coarse wood decomposition and associated biodiversity. I am heavily involved in various global change impact experiments, especially in polar regions.

Broad themes for research projects:

1. Linking variation in plant functional traits among species to ecosystem functions and services
2. Linking functional traits to the decomposition of leaf litter and deadwood across plant species
3. Linking functional traits to the host function of plant litter and deadwood for invertebrate composition and diversity (collaborations with Matty Berg)
4. Linking plant functional traits to fire regimes (experiments in FLARE)
5. Linking abiotic disturbances (fire, drought) and biotic disturbances (fungal or insect attack) to the decomposition and flammability of deadwood
6. Effects of global warming on ecosystem functions and diversity in polar regions (collaborations with Stef Bokhorst)
7. Effects of light, climatic factors and management on the (functional) diversity of green roofs in urban environments.

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- https://www.amsterdamecology.nl/principal-investigators/hans-c-cornelissen/

Toby Kiers

Research theme:

Mutualistic partnerships have been incredibly important in shaping the earth's biodiversity. My aim is to understand how such cooperation between different species evolves and persists. We use experimental evolution and phylogenetic analysis to identify how mutualisms respond to radical changes in their environment. I am interested in identifying the evolutionary selection pressures that shape partnerships in nature and ultimately to identify approaches to conserve mutualisms in the face of environmental change.

My most recent work focuses on trading in nature and how complex 'biological markets' can emerge among plants and their symbiotic fungi. Underground, fungi and plant roots form vast networks of connected individuals, in which sugars from roots are exchanged for nutrients from fungi. We design experiments to understand how cooperation is maintained in these plant-fungal networks.

Using a variety of model systems, my research also explores the concept of 'punishment' and how punishment is used in nature by plants, animals and microbes.

Lastly, I am interested in the accessibility and conservation of plant and microbial genetic resources, and strategies to promote innovation in farming systems. We ask how can evolutionary theory be applied to agricultural systems using a 'Darwinian Agriculture' framework.

Recently supervised research projects:

8. Cytoplasmic flows in asymbiotic networks of *Rhizophagus irregularis*
9. How does phosphate stress alter the tripartite interaction between plant phenotype, rhizobia, and fungal colonisation in a phylogenetic context
10. Conflict between arbuscular mycorrhizal fungi symbionts and host plants as mediated by fungal fitness

Professor Kiers will not be accepting internship students for the 2023-2024 academic year

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Vasilis Kokkoris

Research theme:

Arbuscular mycorrhizal fungi (AMF) are a group of ancient fungi that form a mutualistic symbiosis with most land plants influencing plant productivity, survival, and composition. For these reasons AMF are often used as biofertilizers. Multiple AMF can co-colonize many plant species simultaneously creating extensive interconnected **mycorrhizal** networks bellow our feet. These networks can expand further through connections between genetically distinct individuals where nuclei can be exchanged. My research focuses on better understanding the evolutionary significance of the AMF unique **nuclear dynamics** across scales and specifically how they affect the function and fitness of the interconnected fungi and plants, in diverse abiotic and biotic conditions. I am interested in applying the acquired knowledge towards a more sustainable agriculture and to better understand the challenges that the mycorrhizal symbiosis faces against climate change.

MY RESEARCH AREAS ACROSS SCALES:

a) Nuclear scale
Via a combination of high-resolution molecular methods, advanced microscopy, and imaging analysis, I examine how thousands of nuclei are arranged, coordinated and interact with one another within the multinucleate AMF cells.

b) Network scale
By including trait quantification approaches to the previously mentioned molecular and microscopy techniques I aim to understand in depth the AMF intrastrain interactions and their role at the connectedness of the mycelia. Expanding beyond monoxenic AMF-plant interactions I also explore how the presence of bacteria (e.g. cyanobacteria) affects the morphology and function of fungal hyphae and spores, and how they affect the mycorrhizal networks and the overall symbiosis.

c) Agricultural/Ecosystem scale
Finally with the inclusion of biochemical assessment methods of *in vitro*, *in plantae* and field experiments, I am interested in whether/how the AMF nuclear dynamics affect the: plant response, plant community composition and ecosystem functioning across environmental gradients.

Recently supervised research projects:

1. Symbiotic relationship of arbuscular mycorrhizal fungi and the Nostoc cyanobacteria

Potential research topics:

1. Cryopreservation of AMF spores (position filled)
2. Spatial and functional ribosomal variation in AMF (position filled)

3. Hyphal Healing mechanisms in AMF (position filled)
4. Symbiotic relationship of arbuscular mycorrhizal fungi and the Nostoc cyanobacteria (position filled)
5. The effect of Chloroform on the AMF cytoplasmic flows (position filled)
6. Use of Transparent Soil in AMF cultivation (position filled)
7. AMF in Aquatic Systems: Environmental preservation of reeds (position filled)

Potential literature reviews

1. Spatial and functional ribosomal variation in fungi (position filled)

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Joscha Beninde

Research theme:

I am broadly interested in the ecological and evolutionary mechanisms that structure biodiversity, with a focus on cities and other anthropogenically transformed environments. I am currently focusing on large datasets of species occurrences and genetic diversity for developing spatial modeling methodology. Species occurrence datasets are well-suited for habitat suitability and connectivity modeling and data availability is currently exploding on platforms like iNaturalist. Population genetic data is becoming increasingly available from large-scale, macrogenetic datasets that summarize estimates of population genetic diversity and population genetic differentiation. Pairing these types of data allows us to quantify and predict species resilience given future environmental changes.

Research keywords:

- Urbanization
- Landscape genetics
- Macrogenetics
- Connectivity
- Habitat suitability

Recent, student-led publications:

- Hotspots of Urban Biodiversity
- CaliPopGen

Potential research topics:

- Modelling Biodiversity Hotspots in Amsterdam
- Habitat suitability and connectivity in the KAZA Transfrontier Conservation Area
- Developing a new metric that quantifies the urban affinity of species
- Creating an online platform for measuring urban affinity (e.g., using R Shiny app)

Potential literature reviews:

- Influence of human-mediated dispersal on landscape genetic inference

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Wouter Halfwerk

Research theme:

Sensory systems, such as vision or hearing, form the interface between an animal's interior and exterior environment and their functioning, variability and plasticity is crucial to adapt to a changing world. I want to understand how sensory systems operate, how they evolve and how they mediate ecological interactions. To address these questions I use a highly integrative approach, spanning the fields of sensory ecology, conservation biology, animal communication and evolutionary biology. Historically, most work on sensory biology has taken animals into the lab and applied rigorous techniques to understand how their senses process information. I aim to combine the vast amount of knowledge on sensory biology with evolutionary thinking and I prefer to do this by taking the lab to the field, or when necessary, taking the field into the lab.

This approach allows me to understand the selection pressures acting on, as well as imposed by sensory traits, which I can use to predict whether and how animals adapt to new environments. Most of my work has concentrated on the co-evolution between senders and receivers. Animals emit all sorts of stimuli intentionally (signals) as well as unintentionally (cues) and receivers can perceive these stimuli through a wide range of sensory systems. I study how intended receivers, such as mates or rivals, or unintended receivers, such as predators and parasites perceive these stimuli and how their perception is affected by fluctuating sensory conditions.

Research keywords:

- Animal communication
- Sexual selection
- Predator – prey communities
- Sensory ecology
- Urban evolution

Recently supervised research projects:

1. An evolutionary study on anti-predation traits in moths: Are they acting as trade-off or synergy
2. An evolutionary study on anti-predation traits in moths: Are they acting as trade-off or synergy
3. Investigating selection pressures on ultraviolet reflectant patterns of nocturnal moth wings
4. Life in the spotlight: the effect of long term exposure to artificial illumination on the behaviour of Engystomops pustulosus

Potential research topics:

- Effect of biotic noise on bat foraging behaviour
- Quantifying natural selection pressure on visual camouflage of moths
- Studying trade-offs between thermal and anti-predator traits of moth scales
- Measuring acoustic or visual camouflage on the community level

Dr Halfwerk will be accepting internship students from May 2024 onwards

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