

Prof. Dr. Gudrun **Kadereit**,  
Prof. Dr. Marc **Gottschling**,  
Prof. Dr. Silke **Werth**

# Chair of Systematics, Biodiversity and Evolution of Plants



# Our areas of expertise and research



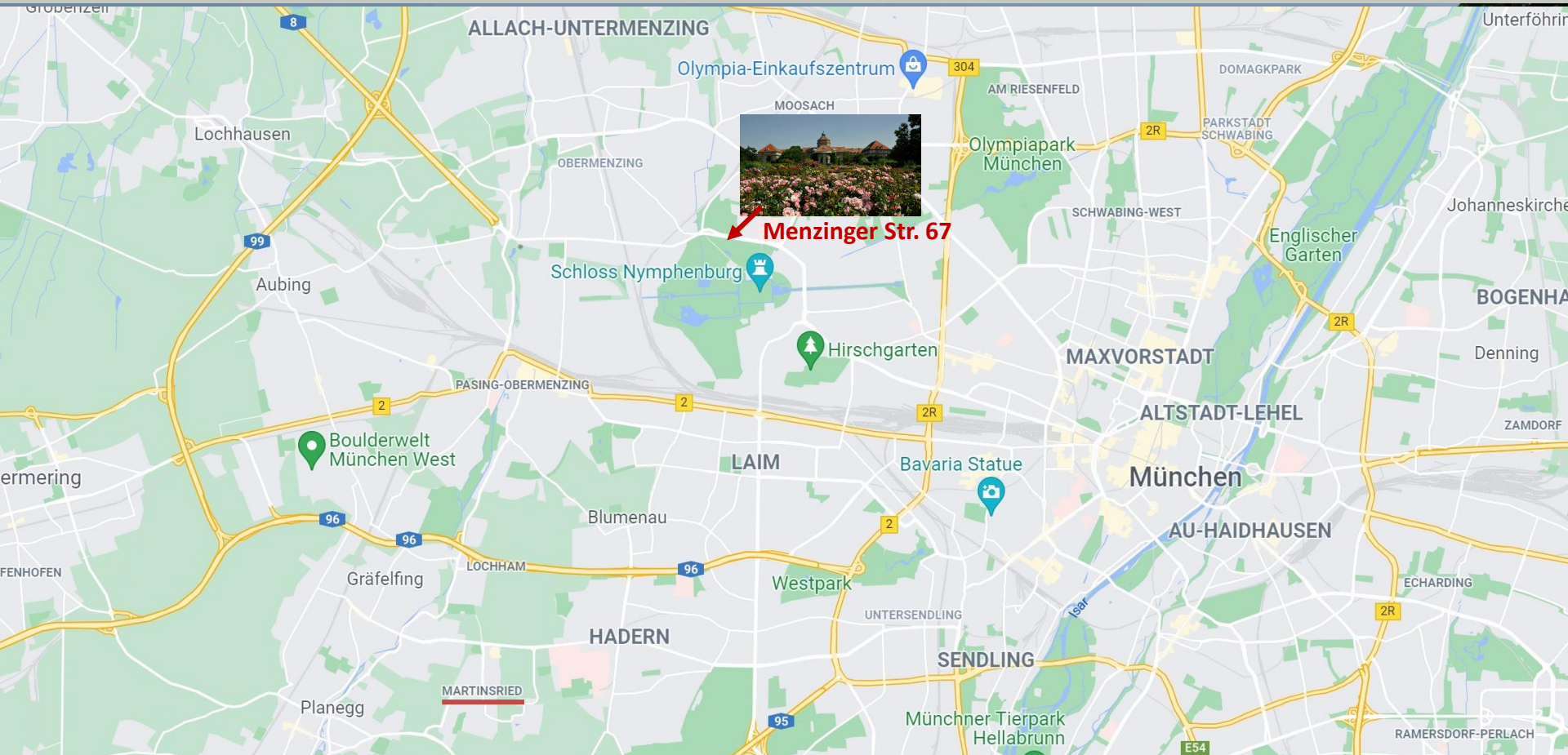
- **Phylogenetics** --- ancestry and relationships of taxa and lineages
- **Evolution** --- diversification and change of a lineage through space and time
- **Morphology and Anatomy** --- form and function of phenotypes
- **Adaptation** --- traits that ensure survival and fitness and their genetic basis
- **Taxonomy** --- discovering, describing and naming taxa
- **Systematics** --- classifying in a natural system based on molecular phylogenetic evidence



You can find us here.



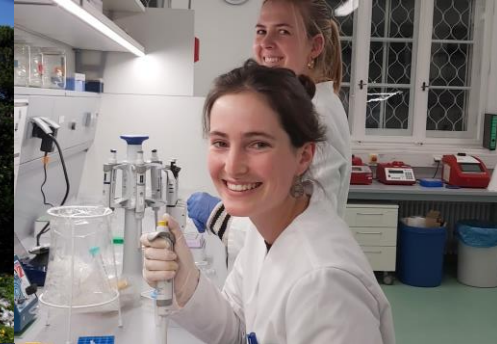
# You can find us here.



# Methods to be used and learned



- **field work** --- observing and collecting of organisms in their natural environment; work with herbarium specimens or living collections; use of large data bases
- **morphology/anatomy** --- morphological analysis, measurements, morphometrics, microsectioning and microscopy (LM/EM)
- **phylogenetics** --- wet lab methods for DNA and RNA-sequencing, bioinformatics, molecular clock, historical biogeography, trait evolution, genome and molecular evolution
- **population genetics** --- quantification of genetic diversity & gene flow
- **metabolomics** --- identification of carbon-based secondary metabolites with chromatography
- **transcriptomics** --- RNA-Seq, expression profiles, identification of candidate genes
- **ecophysiology** --- cultivation experiments, plant performance measurements
- **niche modelling** --- analysing ecological and climatic niches
- **alpha-taxonomy** --- Taxonomic revision, classification, description of new taxa, identification keys & assessment of distribution areas





Prof. G. Kadereit

Interested? Send an email.  
G.Kadereit@lmu.de

## RESEARCH TOPICS

- Diversification, expansion and adaptation of plant lineages in time and space.
- Evolutionary ecology of plant functional traits and their genetic basis.
- TaxonOMICS – integrating modern and classical taxonomy and systematics.

## TRAITS

- C<sub>4</sub> and CAM photosynthesis.
- Succulence and cuticular properties.
- Flower morphology, esp. heteranthery.

and Biogeography



## STUDY GROUPS



CAM specialists  
Crassulaceae



Mega-diverse, tropical  
Melastomataceae



Survivalists and halophiles  
Amaranthaceae



Succulent desert beauties  
Aizoaceae



Extremophiles  
Zygophyllaceae



## Recent research projects by M.Sc. students in the AG Kadereit

- CAM photosynthesis and cuticular properties in Senecioneae (Dilmi Croos)
- Genetic basis of staminal dimorphism in Melastomataceae (Suvrat Kotagal)
- Phylogenetics of Meliaceae (Ramon Vilalta)
- Phylogenomics of *Dysphania* (Francesco Susca)
- Towards a phylogenomic analysis of *Drosera* sect. *Arachnopus* with NGS data (Maruf Abony)
- Phylogenomics of *Moehringia* L. (Caryophyllaceae) revealed as a case of Alps refugial endemics (Audie Masola Putra)



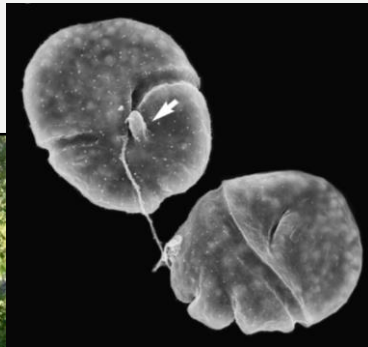
Group meeting in my office (15 persons, 11 nationalities)

# Systematic Botany



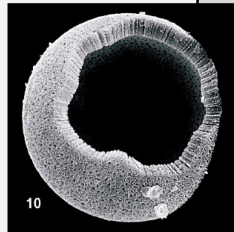
Commissioning final theses of any kind  
(BSc, MSc, state examination)

Boraginales

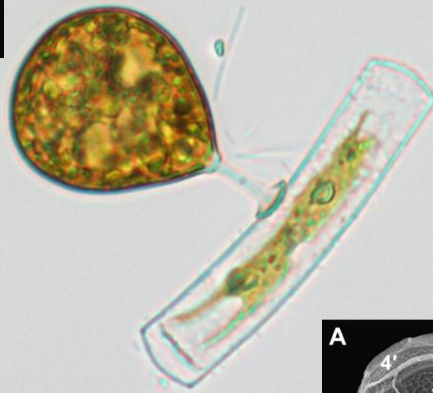


*Borghiella  
tenuissima*

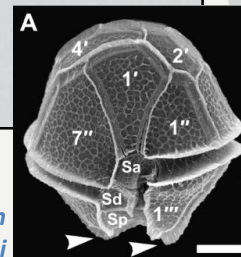
*Caracomia  
arctica*



Dinophytes  
(Protists)



*Cordia sebestena*



*Peridinium  
willei*



*Bourreria  
succulenta*

## Contact information

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# Research Projects



- **Dates**

flexible, at the students' convenience  
rendering **3, 6, or 12 ECTS** points

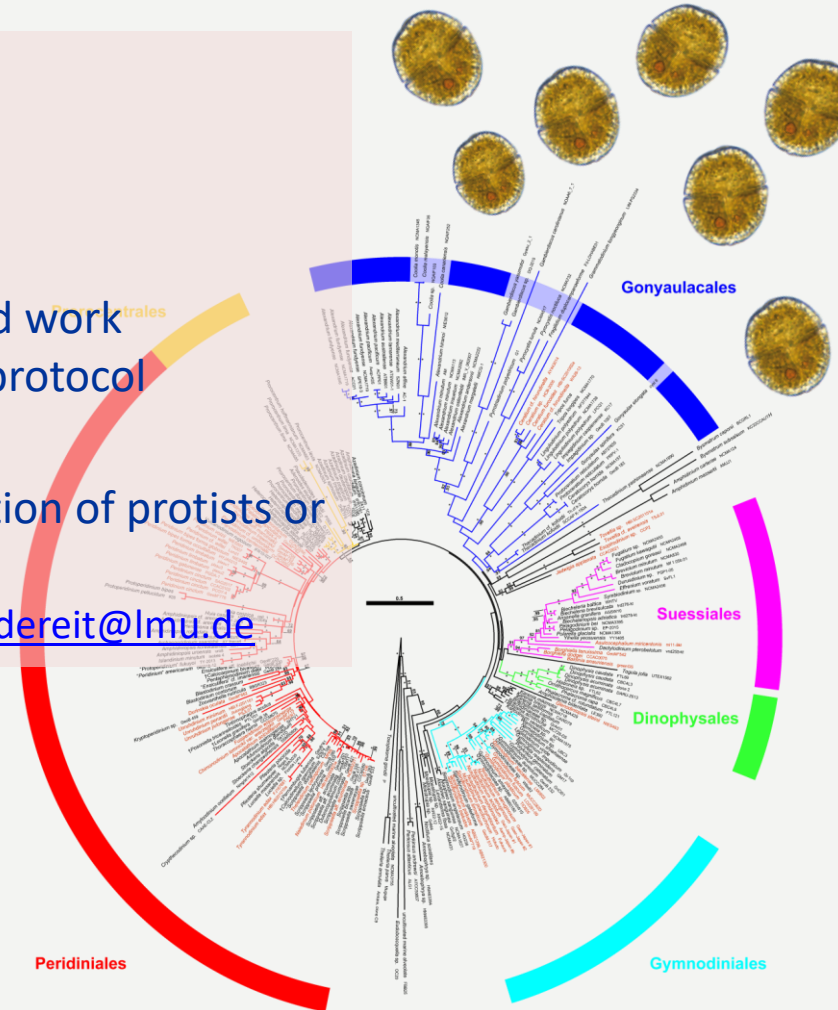
- **Principle Organisation**

Lab work, experiments or collections-based work  
gathering research-related data, research protocol

- **Preconditions**

Interest in diversity, systematics and evolution of protists or  
flowering plants

**please contact:** [gottschling@bio.lmu.de](mailto:gottschling@bio.lmu.de) or [g.kadereit@lmu.de](mailto:g.kadereit@lmu.de)





## Prof. Werth: Population genetics and ecology of lichens



### Research topics

- 1) Gene expression in lichen symbioses
- 2) Stress tolerance of cultivated green algae
- 3) Population genetics and genomics of lichens; phylogenetic analyses
- 4) Diversity of fungal communities along environmental gradients

> **bioinformatics, lab work** or **field ecology** focus



Lung lichen (*Lobaria pulmonaria*)



*Cladonia bellidiflora*



# Methods

- Phylogeographic and population genomic analyses
- Cultivation of algae and fungi in the lab; vitality and growth rate
- Chlorophyll a fluorescence (Imaging PAM, Dual PAM)
- Bioinformatics: Analysis of RNA-seq & comparative transcriptomics data; metagenomic analyses
- Light microscopy, thin-layer chromatography > identification of species
- Analysis of species richness with multivariate statistics & ordination



Lichen hunt in mountain forests (impressions from lichen course)



## Recent research projects by M.Sc. students in the AG Werth

- Epiphytic lichen communities along an landuse gradient (Tobias Karlowski)
- Genome comparison for lichenicolous *Tremella* and its relatives (Silvia Miñana Posada)
- Comparison of mapping tools used for RNAseq (Daniel Juarez)
- Development of biochemical assays to detect innate immunity in lichens (Christopher Tominello)
- Quantification of lichen-associated bacteria with qPCR (Helen Krause)
- Evolutionary history of the lichen *Sticta canariensis* (Andrea Goss)
- Journey to the West: the spread of *Myricaria* from the Himalayas to Europe (Kailin Sun)
- Photosynthetic performance of lichens under light stress (Vigneshwarr Muruga Boopathy)



Student excursion Oberallgäu



# PD Dr. Andreas Fleischmann: biology of carnivorous plants



## Research topics

- 1) Phylogeny of New World sundews (*Drosera*)
- 2) Prey attraction in carnivorous plants
- 3) Carnivorous plant pollination biology



*Pinguicula*, a carnivorous plant that does CAM



examples of sundews (*Drosera*)





# Biology and Systematics of lichens and bryophytes



PD A. Beck

Interested? Send an email:  
[beck@snsb.de](mailto:beck@snsb.de)

## RESEARCH TOPICS

- Systematics and population genomics of lichen fungi and algae
- Lichen metabolomics
- 3D structure of lichens
- Using lichens and bryophytes as bioindicators



Lichens of the Allgäu mountains



Lichens of Cameroon



Metabolomics of *Usnea* in Antarctica



Biomonitoring with lichens and bryophytes

# Master Courses offered

Please check the LSF for dates.



## Winter term

- Practical and Seminar: **Molecular phylogenetics and evolution of plants**
- Practical and Seminar: **Taxonomy and Plant Collections**
- Practical and Seminar: **Diversity of lichens**
- Lecture and Exercise: **Systematic Data and Evidence**
- Lecture and Practical: **Dispersal biology of flowering plants**
- Lecture and Practical: **Botany and mycology**
- Lecture and Practical: **Morphology and diversity of eukaryotic algae**
- **New:** Lecture and Practical: **Functional Plant Anatomy**
- Seminar: **Patterns and processes of adaptation and speciation in the plant kingdom**
- Seminar: **Current Topics in systematic botany --- (Wednesdays, 13:15-14:15)**
- **New:** Seminar: **Ecology of fungi**

## Summer term

- Lecture and Practical: **Evolution of Flowers: Morphology and Function**
- Practical and Seminar: **Plant adaptation to extreme environments**
- Lecture, Seminar and Practical: **Morphology, diversity and evolution of seed plants**
- Seminar: **Biochemistry and biotechnological applications of algae and plants**
- Seminar: **Current topics in systematic botany --- (Wednesdays, 13:15-14:15)**
- Seminar: **Species diversity and evolution of fungi**