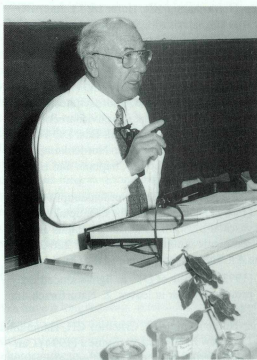


Physiology, Ecology and Anatomy of Plants

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From a historical point of view, the *Division for Physiology, Ecology and Anatomy of Plants* has taken over the role of the whole *Pflanzenphysiologisches Institut*, the former professorial chair for *Allgemeine Botanik* (founded in 1849). From such foundations, the division still reflects an ample breadth of themata.



Teaching

Teaching has always been a predominant (and very time-consuming) duty of the division. Among the subjects taught are plant anatomy, plant physiology, ecophysiology and experimental field ecology, photobiology, histochemistry and basic and applied computing.

Research

Among the scientific research carried out at the division, one should point out the involvement in *ecosystem studies*. As part of the IBP, we have concentrated on the shallow lake "Neusiedler See", a monospecific helophytic gramineae ecosystem. Here, studies on the production ecology of *Phragmites australis* (the predominant primary producer) represented the core of the project.

Years later, a project on wetland management (which was part of the "Arbeitsgemeinschaft Gesamtkonzept Neusiedler See") tried to reveal the possible contribution of summer cutting ("Grünschnitt") of reed on the reduction of nutrient abundance.

Similarly, *Posidonia* plays a predominant role as a primary producer in benthic systems. As part of a zoological project, growth, production and chemical composition were investigated in field, as well as in lab experiments.

The interdisciplinary study, "Ökosystemstudie Donaustau", was carried out to determine the effects of a hydro power plant along the Danube river on the ecophysiology of the flood-plains and their vegetation ("Auwald"). It seems to make sense (though it is more a coincidence) that the head of the division has been involved in the designation of the "Nationalpark Donau-Auen" as chairman of the "National Park Scientific Committee".

As a contribution to the study "Zustandserhebung Wienerwald", made on the large beech forests in the west of Vienna, we investigated water balance and CO₂ gas exchange of *Fagus sylvatica*.

The main topic and the recent focus of the division's research can be best described by the term *urban ecology studies*. These comprise biotope

mapping, bioindication, dendroecological investigations as well as energy- and material-fluxes through the urban ecosystem. The work includes investigations on biomass, litter decomposition and radiation balance studies of urban ruderal biotopes. Touching this topic, traditional photobiological investigations (with an emphasis on UV-effects) have regained new significance with regard to increasing radiation caused by the hole in the ozone-layer. Callus cultures are frequently employed and provide the basis for determining stress effects on plants by electrophoresis. It is worth mentioning that "classic" laboratory experimental work still plays a significant role in scientific investigations.

The interest in the effects of heavy metals on plants (also investigated in combination with other phytotoxic pollutants) led to a series of field trips to study *metallophytes* in the Eastern Alps. Modern analytical tools are used alongside the traditional protoplasmic method to determine plant resistance (well established at the institute ever since Höfler). Floristic and phytosociological implications have to be considered as well. In immission toxicological studies, microscopic and histochemical methods are now supported by x-ray microanalytical techniques.

An inventory of the division's research-fields, however, would not be complete without mentioning the numerous *activities off the mainstream*. For example, there has been a long tradition in studying the problem of stomatal movement. The plant phytochrome system (the reversible R/FR system) has been the topic of numerous publications over the last decades. Other traditional fields of interest that are still alive include heat- and cold-resistance in plants

(experiments date back to the times of Biebl) and field studies on subtropic epiphytes (most recently in Mexico).

During the last years, the division has been engaged in a number of "new" research areas, such as space biology (photosynthesis and productivity of crop plants under orbital light conditions), plant growth on compost, and various others.

Selected References

- Kartusch B, Kartusch R, Weilguni P (1991) Site specific differences in Ca-oxalate contents of the secondary phloem of spruce (*Picea abies* KARST.). *Flora* 185: 377-384
- Maier R, Hietz P, Kovacs G, Mirtl M, Sapelza W, Teuschl G (1989) Zur Ökologie des Auwaldes im Hinterland des Donaukraftwerkes Altenwörth unter dem ökophysiologischen Aspekt der Auswirkung unterschiedlichen Grundwasserstandes auf die Vegetation. In: Ökosystemstudie Donaustau Altenwörth. ÖAW, wiss Veröff d MAB-Programms 14: 211-265, Wagner Innsbruck
- Punz W F, Sieghardt H (1993) The response of roots of herbaceous plant species to heavy metals. *Environ exp Bot* 33: 85-98
- Sacher R, Burian K (1994) Effects of simulated orbital light/dark cycles on the photosynthesis of mungbean, soybean and milled. *Photosynthetica* 30: 215-223
- Sieghardt H (1990) Heavy metal uptake and distribution in *Silene vulgaris* and *Minuartia verna* growing on mining-dump material containing lead and zinc. *Plant & Soil* 123: 107-111