5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Keynote lecture 1: Friday 18th June 2004, 14:15 - 15:00

Recent observations on the genus *Heliamphora* (Sarraceniaceae) and its distribution in Venezuela and Brazil

Andreas WISTUBA, Thomas CAROW, and Peter HARBARTH.

Over the last years we had the opportunity to visit many of the remote table mountains of the Venezuelan south, the so-called 'Tepuis' and other mountains in Venezuela and Brazil that are home of the genus *Heliamphora*. During these visits we made several interesting findings including new *Heliamphora* species and could also gain a better understanding of the species already known and their distribution.

The genus *Heliamphora* is one of three genera of the family *Sarraceniaceae*. Currently *Heliamphora* consists of nine species generally accepted and more await publication.

Most species of *Heliamphora* are growing on the flat tops of a group of remote and isolated table-mountains 2500 to 3000 m high with almost vertical walls, so-called Tepuis. These sandstone mountains are located in the Guayana Highlands of Venezuela near the Borders to Brazil and Guayana.

Many of the Tepuis have just been explored in recent years, some not at all so far. Due to isolation, a lot of endemic plants and animals, among them the different species of the genus *Heliamphora*, could evolve on their plateaus.

Over the last years we had the opportunity to visit several of the remote Venezuelan Tepuis and study the species of *Heliamphora* growing on top, on the foothills and on the faces of these strange and ancient mountains.

We visited the four table mountains of the *Aparaman-group* (*Aparaman Tepui, Murosipan Tepui, Tereke-Yuren Tepui* and *Kamarkaiwaran Tepui*), the *Chimanta Massif*, *Kukenam Tepui, Roraima Tepui, Ilu Tepui, Aprada Tepui, Tramen Tepui, Juruani Tepui*, *Ptari Tepui* and the extremely remote mountains *Cerro Neblina, Cerro Duida, Cerro Marahuaka* and *Cerro Huachamacare*.

As results of these expeditions, so far three new species of *Heliamphora* have been published. During a recent expedition we attempted to find out more about the distribution of the genus *Heliamphora* between the well known northern habitats within the Gran Sabana and the southern Mountains, such as *Cerro Neblina*, *Cerro Marahuaka*, *Huachamacare Tepui* and *Cerro Duida*. A few large plateaus with three of them reaching or exceeding 1700 m altitude (the *Meseta de Jaua - 2200 m*, the *Sarisarinama Jidi - 2500 m and Guanacoco Jidi – 1700 m*) are located in between the two known distribution ranges of *Heliamphora*. We made several attempts in these areas to locate *Heliamphora* but were not successful. As we visited different peaks and found many habitats that seemed suitable for *Heliamphora* we conclude that *Heliamphora* does not grow in these areas, at least not in habitats that seem typical based on our knowledge of the populations known so far. This is very interesting as it leaves the question how the two known distribution ranges are related.

Literature

George, U. (1988) Inseln in der Zeit, GEO im Verlag Gruner + Jahr AG & Co., Hamburg.

Maguire, B. (1978) Sarraceniaceae (*Heliamphora*), in: The Botany of the Guyana Highland Part-X, Memoirs of the New York Botanical Garden, ***29***: 36-61.

Nerz J. and Wistuba A. (2000) *Heliamphora hispida* (Sarraceniaceae), a new species from Cerro Neblina, Brazil-Venezuela, *Carnivorous Plant Newsletter*, ***29***: 37-41.

Steyermark, J.A. (1984) Venezuelan Guyana, *Annals of the Missouri Botanical Garden, **71***: 302-312.

Steyermark, J.A. (1986) Expedition to the Lost World, *Annals of the Missouri Botanical Garden*, ***74*** (7): 5-7.

Wistuba, A., Harbarth, P. and Carow, T. (2001) *Heliamphora folliculata*, a New Species of *Heliamphora* (Sarraceniaceae) from the 'Los Testigos' Table Mountains in the South of Venezuela, *Carnivorous Plant Newsletter*, ***30***:120-125.

Wistuba, A., Carow, T. and Harbarth, P. (2002) *Heliamphora chimantensis*, a new species of *Heliamphora* (Sarraceniaceae) from the 'Macizo de Chimanta' in the South of Venezuela, *Carnivorous Plant Newsletter*, ***31***: 78-82

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Friday 18th June 2004, 15:00 - 15:30

Carnivorous Plant Expedition in Venezuela and general plant protection and conservation

Drs. Ing. **Gert HOOGENSTRIJD**, Amsterdam, Holland, www.extreme-plants.nl

The genus *Heliamphora* belong the oldest and most simple carnivorous plants. They are found with *Genlisea*, *Drosera*, and *Utricularia* in South America where they grow in areas such as sabana's, mountains and specially at table Mountains The presentation will show a summary of various expedition to the Gran Sabana area, western Sabana's of Venezuela and table mountains like Duida, Roraima, Ilu, Tramen, Wei and Huachamacare. These enormously tall table mountains often have very steep rock walls up to 3000 metres high.

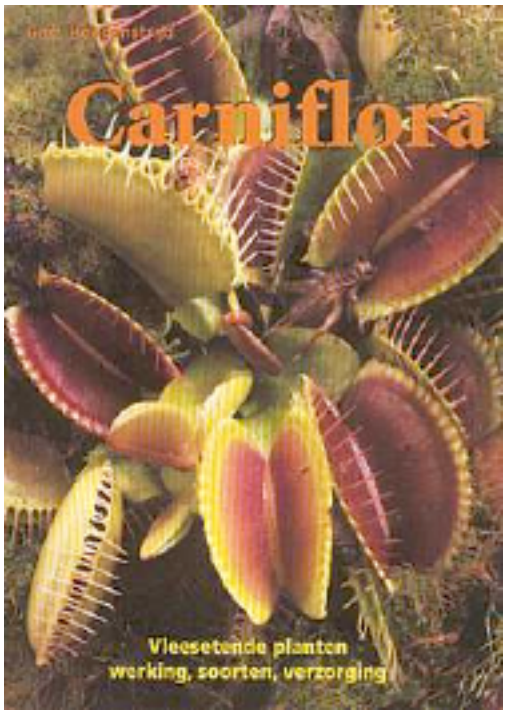
They form a strong contrast with the tropical Amazon forest underneath. The local inhabitants named them Tepuis 'Houses of the Gods'. These mountains are left over from the Stone Age and every mountain has its own unique and particular flora and fauna. The species such as the *Heliamphora heterodoxa*, *H. ionasi*, *H. tatei*, *H. minor* and *H. nutans* occur only in these mountains. Here they grow in little swamps or in between other plants. In this environment the plants enjoy a moderate temperature, a high degree of humidity and a large intensity of sunlight. Eight different species have been discovered and described thus far. Due to the inaccessibility to these areas there has not been a lot of research done yet. Due to this, it is highly possible that even more unknown species exist in this area, especially at the non-accessible slopes. All species have the same horn-like shape. The plants all have frail yellow-green or green pitchers with traces of red.

Deforestation, geographical monopolization of land for agricultural use, more roads, urbanization, pollution, global warming and drought are just a few of the reasons that carnivorous plants are threatened by or already suffer from extinction. The Venus Fly Trap and some of the American and Tropical Pitcher Plants in particular suffer from the threat of extinction. Endangered plants worldwide include the *Sarracenia* such as the white and yellow Trumpet Pitcher, the Venus Fly Trap, some nepenthes species.

Ways to protect these fragile environments will be discussed as well as the possibilities for sustainable or eco-tourism or plant breeding systems that are income generating for local habitants

Sometimes collecting of plants in the wild by individuals can form a real threat to a species. This is mainly the case concerning a few very rare and spectacular tropical carnivorous plants. These plants have a limited way in which their seeds are spread and taking away these plants or their seeds will threaten their existence. A good example from a couple of years ago is that of the largest tropical pitcher plant, *Nepenthes rajah*. This collector's dream has a pitcher catcher with an eighteen-centimetre diameter. This highly rare plant can sell for hundreds of euros. Even the moderate enthusiast was prepared to pay a high price for this plant. Luckily the plant is now cultivated from tissue culture. Now any enthusiast can purchase one for a reasonable price. For the well-intended plant collector who does not want to inflict any damage on nature there are, in short, choices enough to choose from thanks to tissue culture.

The fascinating life cycle of carnivorous plants can also be observed from your living room. Many different species are sold all over the world however, only a small percentage of these species are sold in the Netherlands. The plants are offered year-round. The largest supply in the Netherlands is offered from March – October. Dutch nurseries comprise 1.5 million of the plants that are sold yearly to consumers around the world. For years, a wide assortment of species such as the Venus Fly Trap (*Dionaea*), North American and Tropical Pitcher Plant (*Sarracenia* and *Nepenthes*), Sundew (*Drosera*), different Butterworts (*Pinguicula*) and Bladderworts (*Utricularia*) have been cultivated. By in large, the plants are cultivated from seed or tissue culture in greenhouses that provide an optimal surrounding. Plants are also cultivated by division or transplanting. These methods are used for only a small amount of special plants such as the Bladderwort (*Utricularia sandersonii*, *U. calycifida* and *U. livida*), the Butterworts (*Pinguicula gypsicola*, P. *primuliflora* and *P. moranensis*) as well as the Cobra Lily (*Darlingtonia carlifornica*).



Gert Hoogenstrijd was born in the Netherlands in 1967. He started to grow carnivorous plants when he was 16 as both a hobby and passion. For him cultivation of carnivorous plants began on the windowsill, but since the age of 18 has branched out onto his balcony and in greenhouses. He has a master's degree in Energy and Environmental Science with specialisation in Biology. The many different places in which he has lived and worked as a energy and environmental specialist for developing countries and conducted research include countries in Asia, Africa and Latin America. In his free time, carnivorous plants often provide the inspiration to explore unbeaten paths in search of new plants, such as for instance the Table Mountains of South America. At the moment he is working as a specialist on topics as "nature and health" and "sustainable Tourism for the The Advisory Council for Research on Spatial planning, Nature and the Environment (RMNO). This council gives advise to the government of The Netherlands on research into problems in a specific sector of society. He is the author of the Carniflora booklet in both Dutch and English (www.extreme-plants.nl). Gert Hoogenstrijd was a board member of the Dutch Carnivorous plants group 'Carnivora', for 14 years.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Friday 18th June 2004, 15:30 - 16:00

A functional description approach of the summit biotopes (> 2000 m) of Auyan-Tepui (Venezuela)

Philippe NAMOUR, Association Dionée, Jardin Botanique de Lyon, Parc de la Tête d'Or

We propose to describe the top of Auyan-Tepui (> 2000 m), according to three nested logics (Fig. 1). First a logic of form, made up of the geomorphological factors on which is articulated a logic of matter & energy fluxes. From the nesting of these two logics (form & fluxes) we define four functional units (UF), unitary biotopes sheltering a standard flora of Auyan-Tepui:

UF1: summit terrace;
UF2: percolating wall;
UF3: sand bank;
UF4: shallow.

Fluxes and stability order in an increasing way are supposed to be as follows:

Matter flux from UF1 to UF4;
Energy flux from UF4, UF2, UF3 to UF1;
Constancy & stability UF1, UF3, UF2 to UF4.

This approach functional has immediate implication on our culture conditions of the carnivorous plants from the Tepuis.

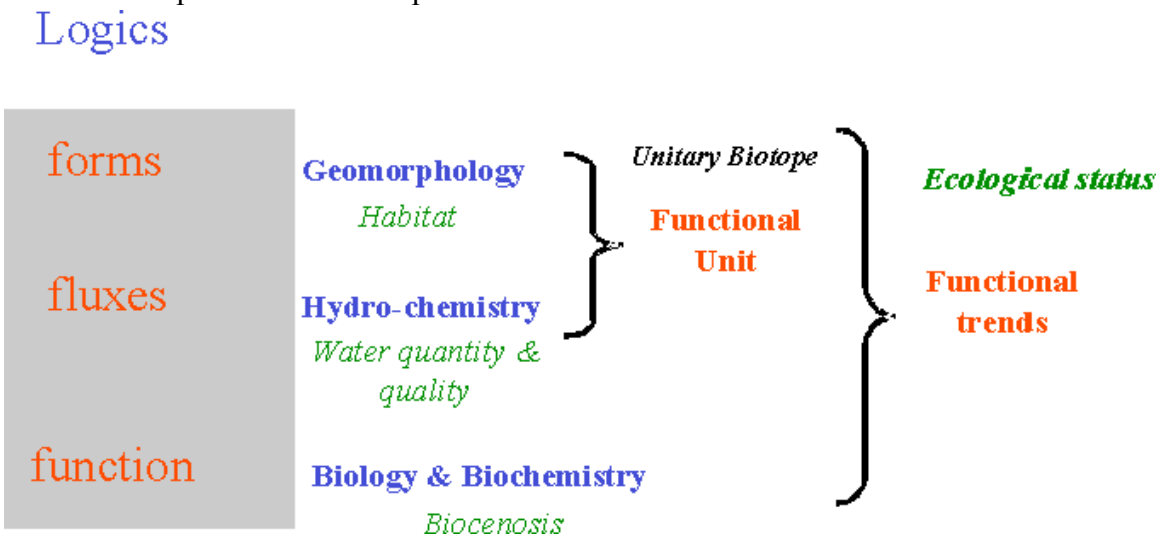


Fig. 1: Conceptual approach of Auyan Tepui organization in three nested logics

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Keynote lecture 2: Saturday 19th June 2004, 9:00 - 9:45

Ten years after the introduction of *Aldrovanda vesiculosa* to the Czech Republic

Lubomír ADAMEC, Institute of Botany,Czech Republic

Aldrovanda vesiculosa L. is a critically endangered aquatic carnivorous plant, rapidly vanishing from Europe. In the Czech Republic, this species has an official status of extinct species as the only site in N Moravia vanished in the 1950s' (Adamec & Lev 1999). In 1994-1995, I tested experimentally using nylon enclosures the suitability of 6 selected dystrophic sites in the Czech Rep. for both seasonal growth and overwintering of *Aldrovanda* plants (population from E Poland). Very positive results at 3 of these sites (Adamec 1999) became the basis for officially approved, free introduction of *Aldrovanda* to these and other sites in 1994, 1995, or later, to strengthen its European populations as an active and effective measure for its all-European conservation (see www.bestcarnivorousplants.com/aldrovanda/).

Tab. 1. Summary of *Aldrovanda* introduction to Trebon region, S Bohemia (upper part), and Doksy region, N Bohemia (bottom; separated by dashed line), Czech Rep. *, extinction.

Site	Year of introd.	No. intr. apices	Total number of shoot apices in 2001	2002	2003	Remark
Ptaci blato-1st pool	1995	90	≈20,000	≈15,000	≈12,000	gradual eutrophication
Ptaci blato-2nd pool	1995	42	≈2,000	≈200	0*	infilling of the pool
Ptaci blato-3rd pool	2000	≈50	≈1,000	≈4,000	≈4,000	sustainable state
Ptaci blato-9th pool	1995	39	≈2,000	≈2,000	≈500	infilling of the pool
Domaninsky fishp.	1995	32	≈50	≈30	0*	dredging of the habitat
Vytopa fishp.	1997	≈50	≈4,000	≈5,000	≈3,000	overgrowing by sedges
Karstejn fen pool	1998	≈60	≈100,000	≈20,000	≈20,000	depends on water level
Branna sand-pit	2000	≈30	≈200	≈1,000	≈200	depends on water level
Mariansky fishp.	1994	60	0	0	0*	plants grazed by ducks
Srni Potok pool	1994	60	0	0	≈200	unknown stock in 2003
Brehynsky fishp.	1994??	??	50-60	≈100	160-180	transport by water birds?

Ten-year experience in *Aldrovanda* introduction to the Czech Rep. shows convincingly that *Aldrovanda* can grow successfully in abundant populations at new sites also in an intensively agricultural landscape, where it had never been documented. These newly established populations belong to most abundant ones in Central Europe. The sites are usually reed- or sedge-dominated shallow dystrophic wetlands as remainders of former fens or peat-bogs close to hypertrophic fishponds. Very low water level in summer has been found as the limiting factor for growth and propagation of *Aldrovanda* as in dry seasons, its niche is greatly restricted. High water level in itself is favourable for its fast propagation but it causes the inflow of nutrient-rich water from adjacent hypertrophic fishponds to these oligo-mesotrophic sites. This leads to their gradual eutrophication and infilling (Tab. 1: Ptaci blato pools). Summer growth of *Aldrovanda* has been shown as rather tolerant to water chemistry. Its growth may be even faster under mildly eutrophic than oligotrophic conditions. Generally, its seasonal population growth

can be 2-25 times in suitable habitats (Adamec and Lev 1999). However, eutrophication symptoms cumulate in time and finally lead to unfavourable conditions as occurrence of water blooms and/or filamentous algae, high pH (low [CO_2]), or overgrowing by aquatic weeds, leading to *Aldrovanda* decline. This situation has begun taking place in Ptaci blato pools (Tab. 1), while the trophic conditions at Karstejn are quite sustainable and *Aldrovanda* has a long-term capacity to form an abundant stable population over 100,000 shoot apices for many decades. The same may hold for Brehynsky fishpond.

References

Adamec L. (1999) *Folia Geobotanica, **34**:* 287-297.
Adamec L., Lev J. (1999) *Folia Geobotanica, **34**:* 299-305.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Saturday 19th June 2004, 9:45 - 10:15

The ICPS *Sarracenia* distribution program: Satisfying the hunger of poachers?

John BRITTNACHER & Barry RICE**,** International Carnivorous Plant Society.

In 2000, the International Carnivorous Plant Society (ICPS) funded a meeting attended by land managers who had direct stewardship responsibilities of populations of *Sarracenia oreophila*, an endangered pitcher plant (Meyers-Rice, 2001). One of us (BR) attended this meeting and was appalled to learn that all the land managers were concerned about poaching of rare pitcher plants—poaching was occurring at all the sites they maintained. Since the sites were usually somewhat difficult to find, it was extremely unlikely casual visitors were doing the poaching. It is more likely carnivorous plant horticulturists were doing the poaching. At that meeting, one of us (BR) decided to seek some way to try to decrease poaching pressures by satisfying the hunger of poachers.

Three rare pitcher plant species have special USA status as endangered: *Sarracenia alabamensis*, *S. jonesii*, and *S. oreophila*. Interstate sales of endangered species are prohibited without difficult-to-obtain permits. Since the ICPS is a registered nonprofit corporation and could demonstrate the purpose of this project was at least in part to help protect the plants, we were able to obtain permits from the US Fish & Wildlife Service. Seeds of *Sarracenia alabamensis* from three sites were donated to the ICPS by land owners/managers and were germinated at both our private homes and raised for two years at facilities provided by the University of California, Davis.

Notice of the plan to distribute pairs of two to three year old plants to the ICPS membership was published in the ICPS's journal (Rice, 2003_a). A total of 318, 5—15 cm tall plants were shipped in June 2003 (Rice, 2003_b).

A follow-up survey found that despite the mailing of plants in summer, approximately 99% of the plants survived. While the recipients of the plants were almost uniformly happy with the plants, they would not have been as satisfied if the plants were only a few cm in height.

This program was certainly useful in helping provide horticulturists with location-coded plants. However, it will only be regarded as a conservation success if seeds coded with locations start appearing in seed banks. If this program were repeated, it would probably focus on *Sarracenia oreophila*, since many growers specified this as a plant of great interest. To expand the program outside the USA, ICPS members in other countries would need to volunteer a substantial amount of time and growing space.

References

Meyers-Rice, B.A. (2001) Rare *Sarracenia* poaching and the ICPS, *Carnivorous Plant Newsletter*, ***30***: 43-50.

Rice, B. (2003_a). *Sarracenia* distribution program, *Carnivorous Plant Newsletter*, ***32***: 4-7.

Rice, B. (2003_b). News and Views, *Carnivorous Plant Newsletter*, ***32***: 125-126.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Saturday 19th June 2004, 10:15 - 10:45

Effective *ex-situ* conservation of endangered species through cultivation.

Fabio D'ALESSI, Department of Biology, University of Padua, Padova, Italy.

At present a large number of specimens of endangered species of carnivorous plants are cultivated in private collections. Every year the maintainers of such collections of endangered plants spend considerable amounts of time, work and money to preserve the status of their collections. Unfortunately while a big effort is often carried out by paying big attention at the beauty, commercial value and rarity of the cultivated specimens, there rarely is any coherent conservation-wise goal.

If the increasing availability of cultivated plants doubtlessly reduces the impact of plant collection in habitat, on the other hand these same cultivated specimens do not effectively reflect the biodiversity and dynamics of wild populations making them unsuitable for eventual population restoring or reintroduction in habitat.

In this speech solid requisites needed to run a good conservation plan will be discussed in detail, and a different cultivation and collection management approach will be proposed. The proposed approach could effectively preserve the genetical heterogeneity of specific wild populations of endangered species, making it possible to achieve an effective *ex-situ* conservation through cultivation. This is particularly needed now that many populations of endangered species show substantial erosion by human activity and urbanization.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Saturday 19th June 2004, 11:15 - 11:45

The Weird, Wild, Wacky and Wonderful World of Carnivorous Plants and Beyond.

Teresa A. GOLEMBIEWSKI, University of Wisconsin - Whitewater, Biology Department, Whitewater, WI, 53190, USA,

In January of 1998 I began to teach a course entitled "The Weird, Wild, Wacky and Wonderful World of Carnivorous Plants". I reported on this fledgling course at the Second ICPS conference in California. I have since taught the course seven times. Here I report on the maturation of the course and what I have learned along the way. I also indicate my plans for the future.

The specifics of the course "The Weird, Wild, Wacky and Wonderful World of Carnivorous Plants" are detailed in the Proceedings of the 2000 International Carnivorous Plant Society. While the structure of the course remains much the same, the implementation of the course has evolved through each session. In the years I have taught the course, I've learned to value my hired student helper and the volunteer assistance of two parents. They allow me to cover eight activities in each two hour session.

Now that "The Weird, Wild, Wacky and Wonderful World of Carnivorous Plants" has matured and stabilized, I am developing an advanced carnivorous plants course. In an intense weekend workshop, students will gain specific knowledge of Wisconsins' fourteen carnivorous plant species by seeing, reading and hearing about them. Learning games, such as carnivorous plant Jeopardy, will reinforce this knowledge. Students will work independently on specific aspects of carnivorous plants that interest them through projects, such as the construction of thematic posters. The highlight of the two day workshop will be a field trip to a local bog where pitcher plants, two species of sundews, and three species of bladderworts can be seen.

Saturday 19th June 2004, 11:45 - 12:15

The French Mires Resource Center, a tool dedicated to bogs and mires, as well as their inhabitants... like carnivorous plants

Francis MULLER, Fédération française des conservatoires d'espaces naturels, 32 Grande rue, F-25000 Besançon, Website : www.pole-tourbieres.org

Bogs and mires are a type of highly original biotopes that host, among many others, several species of carnivorous plants. One reason of the development of these habits, quite 'strange' for plants, is the lack of some elements like nitrogen in peat bogs. In order to fight their deficiency in such poor biotopes, some plants succeeded in developing traps that enable them to capture insects or other tiny animals. Carnivorous plants are often characteristic of different parts, or of specific stages in the life of the bogs; e.g. *Drosera rotundifolia* is spread in rather pioneer habitats, whilst *Utricularia major* is found in some acidic ponds. Thus, they are an interesting part of bogs, but nevertheless one only of many diverse components of these biotopes.

In Central and Southern Europe, bogs and mires were never as widely present as in the Atlantic or boreal countries of the continent. In fact, they are favoured by rather cool and wet climates in which the water balance is always positive. Furthermore, all highly populated European countries intended to dry their wetlands, which were considered as useless when not harmful or even dangerous places. Not at all taking into consideration the positive effects they can have on climates, water regimes… and biodiversity!

In these countries, the surface of bogs and mires has often been reduced by about 50 to 90 % since the 19th century. And they all still threatened by drainage, construction, peat extraction and many other causes of destruction. A sustainable network of sites, in good condition and dense enough, must absolutely be maintained, in order to preserve the species and the plant associations.

Helping to know more about our mires and the life they host, exchanging information about them and about the accurate management that can be implemented, advising private and public bodies in charge of bogs and mires, and monitoring the effects of public policies dedicated to the protection of these wetlands is the part of the French mires resource centre, established in Besançon, at the foot of the Jura hills (eastern France). It was founded in 2001 by the French ministry of ecology, and is run by the "Federation des Conservatoires d'espaces naturels".

This centre includes a documentation centre, open to the public in Besançon, where a librarian can help anyone to find the requested information.

The centre publishes a newsletter "L'Echo des tourbières" and an electronic bimonthly letter "Tourbières infos". Other documents concerning the bogs and mires are published or put on line on our website (this latter including a developing English-language section).

Specific actions dedicated to the protection of bogs, mires and fens are lead with different organisations or administrations, concerning different parts of the country like the Pyrenees or the Massif Central, or some topics like how to favour peat-free growing media, how private forest owners can help keeping their bogs or how to increase public awareness about bogs…

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Saturday 19th June 2004, 12:15 - 12:45

Glandes digestives de l'Utriculaire : Ultrastructures et fonctions. Essais de localisation d'activités enzymatiques (protéases, phosphatases acides).

Colette VINTEJOUX, Société botanique de France, Almas SHOAR-GHAFARI, Société botanique de France. 41, av. des bosquets, 85100, Les Sables d'Olonne.

Les glandes digestives de l'Utriculaire, insérées sur la paroi interne des organes de capture, ont une organisation complexe, comportant une cellule de base rattachée à deux (ou quatre) cellules longues et étroites : les processus bifides ou quadrifides. Nous avons précédemment étudié leur organisation ultrastructurale et montré qu'elles étaient le siège d'une intense activité phosphatasique acide. La présence de protéases, provenant de ces cellules a été effectuée par digestion de gélatine photographique (application de la paroi interne de l'utricule à la surface d'un film préalablement impressionné à la lumière et recouvert d'une solution tampon de pH 5,0). Les techniques d'extraction enzymatique (utilisées en microscopie électronique), nous ont permis de préciser la localisation de protéases (de comportement analogue à la pepsine), dans diverses inclusions cytoplasmiques, de dimensions diverses, et également dans des sites externes, mais très proches de la paroi.

Les techniques d'extractions enzymatiques nécessitent une incubation préalable des sections dans une solution d'acide periodique. Les caractères ultrastructuraux des « grains de sécrétion » ont ainsi été définis et décrits dans le cas des trois conditions expérimentales : préparations témoins (double fixation et contraste des sections) ; préparations ayant subi une incubation dans l'acide periodique ; préparations ayant subi successivement les effets de l'acide periodique et de la pepsine exogène. Les observations ultrastructurales ont été confrontées avec les données biochimiques (bibliographiques) bien précisées dans le cas des cellules animales (formes actives ou inactives). Ces résultats devraient permettre de mieux connaître l'emplacement de tel ou tel site moléculaire, dans les inclusions étudiées, destinées à induire la libération d'enzymes protéolytiques, à partir de structures de réserves.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Keynote lecture 3: Saturday 19th June 2004, 14:15 – 15:00

BEAUTIFUL AND HUNGRY - CP©" – An Attempt to Spread the Knowledge on Carnivorous Plants by the Private Production of Entertaining Movies on Their Characteristics, Behaviour and Natural Habitats.

Siegfried R.H. HARTMEYER, Weil am Rhein, Germany, Internet: www.hartmeyer.de

After the making of several celluloid-footage for friends and family on our travelling in Europe, Africa, and Asia since 1978, my wife Irmgard and myself decided 1989 to upgrade our equipment to the Super-VHS video standard, and to focus the subject of our movies on our second passion, the carnivorous plants. Meanwhile our equipment is fully digital. Our goal was - and is still - to spread the knowlegde on those fascinating genera by showing our movies not only to friends, but also at several events as CP- (and other) society meetings, and in botanical gardens in Germany and Switzerland. 1994 we decided to produce our movies also in the English language. A new project was born, that we called "BEAUTIFUL AND HUNGRY - CP© ". Giving an example, we show now some footage, featuring *Byblis*, *Cephalotus*, numerous Australian *Drosera*, the Seychelles pitcher plant *Nepenthes pervillei*, and as a "botanical guest", also *Stylidium* (Triggerplants) can be seen "in action".

1997 Irmgard and myself have been invited by the trade-fair "Regio-Messe-Lörrach" (Germany) to organise a big and 10 days lasting CP-event. It was possible to co-operate with the two botanical gardens of Basel (Switzerland), the Swiss CP-friends, the German GFP, even with the French CPS "Dionée" and the CP-nursery Carow&Wrono. 65'000 visitors have been fascinated by the plants and CP-movies, which has been reported by several radios and newspapers. Several schools visited the exhibition, taking lots of info-material on CP for future lessons. Additional important was, that we came together with a company, interested to produce a CD-ROM. Thus, a spin-off product of this successful CP event was the first interactive CD-ROM on CP, which could be released 2000 by that company (IBS-Multimedia), using our meanwhile registered new label *HUNTING VEGGIES®*. On this place we show some features like "A simple method for enzyme-testing" and the "CP-encyclopaedia" from the CD's English edition.

Since 1999 we use full digital equipment, including a professional editing software. So more projects could be realised, as i.e. the production of two movies on the International Carnivorous Plant Conferences in San Francisco (2000) and Tokyo (2002). We tried our best to achieve the best possible quality and - using some digital features - to keep the footage as entertaining as possible. Actually, it was possible to record two great CP events and I'm gonna show some short sequences at this place.

Finally we show a small sequence from our successful movie FLEISCHIMANIA (2001), which meanwhile found even the interest of 2 TV stations, and will maybe confirm the rumours on our topic, and still not published CP- project…

Saturday 19th June 2004, 15:00 – 15:30

Pinguicula species in the South-Eastern United States – Illustrated habitats in Florida

Oliver GLUCH

In the South-eastern United States 6 *Pinguicula* species are endemic. During a trip at the end of February 2003, the author was visiting different sites in Florida of *P. lutea*, *P. planifolia*, *P. ionantha*, *P. caerulea* and *P. pumila*.
Florida is a mostly flat region (highest point 345 ft/105 m). The Florida Peninsula is a limestone plateau formed 50-60 million years ago. On top of the bedrock there is a layer made up of deposits (mostly clay, but sometimes also pure sand) from ancient rivers from the Appalachian Mountains. The clay layer is impervious to water with the effect that in many areas the rainwater cannot seep through the underlying limestone bedrock and therefore forming a large area of wetlands. *Pinguicula* species often can be found together with saw grass, wire grass, Sabel palms, palmettos and pine trees.
Different habitats of *P. pumila* in Hernando County (Western Florida), in the Big Cypress National Park and on the southernmost site on Big Pine Key are shown. The effect of different soil and growing conditions on plant size and flower variation are demonstrated. Especially the populations in Western Florida are showing a large variation in flower form and coloration, including the "areola" form. Also the rosette size is much bigger than seen in other locations.
The habitat of *P. ionantha*, the most endangered and only protected butterwort variety by CITES in the U.S., is shown at one location in the Panhandle in Franklin County. The species is growing there beside the road in a wet habitat together with *Drosera capillaris*. Also a plant with a less common violet flower is shown.
P. planifolia the most "aquatic" species is often growing completely under water. Two locations in Liberty County are shown where species often grows together with *Drosera capillaris* and *Sarracenia* species.
End of February *P. lutea* was just beginning to flower. This species likes more drier areas in open grassland. 2 locations in Pasco County and Liberty County are illustrated. Also the location of *f. alba* was visited, but no white flowers could be detected, as flowering buds were just beginning. *P. lutea* grows there together with *Drosera brevifolia*.
One location of *P. caerulea* near West Palm beach is shown. The plants grow in a tall grasses and often shaded by palmettos in a very sandy soil. This species grows under more drier conditions. The flower forms and coloration vary a lot at this site.
The populations of the different *Pinguicula* species face an uncertain future. Florida ist still an immigration country where the need of housing and road construction in combination with draining larger areas is continuing in the future and will dry out some sites. Also agriculture (in form of fertilizer and pesticides) influences more and more the populations in the Southern part of Florida. There are large timber companies owning most of the woodlands in the Panhandle area. Any change in the water management and the planting of different 3 species could cause a dramatic change in growing conditions. If only some isolated protected areas would finally remain, it will be quite uncertain if all butterwort species would survive in the future, especially the already endangered species *P. ionantha* and *P. planifolia*, which already grow in a quite restricted area.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Saturday 19th June 2004, 15:30 - 16:00

The Cuticular Pores in Glandular Hairs of *Genlisea* St.-Hil. in Relation to their Functions

Bartosz PŁACHNO[1], Jadwiga FABER[2] & Andrzej JANKUN[1]

[1]Department of Plant Cytology and Embryology, Institute of Botany, The Jagiellonian University, Krakow, Poland

[2] Department of Cytology and Histology, Institute of Zoology,The Jagiellonian University, Krakow, Poland

Traps of six species of *Genlisea*: *Genlisea lobata*, *G. violacea*, *G. sp.* "Itacambira Beauty", hybrid *Genlisea lobata* x *Genlisea violacea* (subgenus Tayloria) and *G. pygmae*, *G. hispidula* (subgenus *Genlisea*) were examined. For scanning electron microscopy (SEM) traps were cut and fixed in 3% phosphate-buffered glutaraldehyde for 2 h in room temperature or in ethanol/acetic acid (3/1) and then dehydrated through an ethanol series. Material was critical-point dried using liquid CO_2. The dried tissues were coated with gold and viewed with HITACHI S-4700 SEM (in the Scanning Microscopy Laboratory of Biological and Geological Sciences of the Jagiellonian University, Krakow). The presence of cuticular discontinuities of living hairs was tested by using vital stain: neutral red (1%).
Despite a diverse morphology, all glandular hairs of the traps have the same basic structure. Each hair consists of three types of cells: basal cell, middle cell with impregnated lateral wall, and one or more terminal cells. Terminal cells of the external and internal glandular hairs absorb neutral red. The cuticle of the trap is impermeable with exception of cuticle of terminal cells of the glands. Using SEM we detected cuticular pores in external and internal hairs both in neck and bulb of the trap. Glandular hairs in the bulb serve two main functions: the discharge of hydrolytic enzymes and the absorption of the products of digestion. The pores in the cuticle and wall ingrowths (on the radial walls) are involved in these processes. The presence of discontinuous cuticle in terminal cells of external hairs suggests that these hairs are responsible for water absorption with mineral solutes from external medium.

Up to now cuticular pores in carnivorous plants have been detected using SEM only in Drosera tentacles (Wiliams & Pickard 1969, 1974 after Juniper *et al*. 1989).

References

Juniper B. E., Robins R. J., Joel D. M. **(**1989) *The Carnivorous Plants*. Academic Press, London, United-Kingdom.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Saturday 19th June 2004, 16:30 - 17:00

Biological diversity in the genus *Utricularia* (Lentibulariaceae)

Aline RAYNAL-ROQUES and **Joël JÉRÉMIE**

The genus *Utricularia* L. (Lentibulariaceae) includes ca. 220 species found in various environments (aquatic, terrestrial-swampy, epiphytic), all of which are generally water saturated. Many species show adaptations to a free floating way of life, including the presence of air tissues, floats, turions, and the lack of support tissues. Plants fixed to their substrate have peculiar organs (« stolons », « rhizoids », « tubers », « leaves ») whose morphological significance is still obscure. The floral biology of members of the genus is also diverse. The flower presents morphological characters generally considered to be adaptations to insect pollination: vividly colored flowers, strong zygomorphy, a spur born by the lower lip of the corolla, floral glands, stigmatic sensitive movements. However, xenogamy appears to be scarce, numerous species of *Utricularia* being autogamous; cleistogamy, either opportunistic or architectural, occurs in several species. Because of their preference for undisturbed fresh waters and wet substrates, most of these plants are found in particulary fragile, oligotrophic biotopes (pools, bogs, tropical rain forests) that are often threatened and whose protection is required for their survival.

Saturday 19th June 2004, 17:00 - 17:30

Traps and trapping mechanisms in *Utricularia*

Marianne PEROUTKA, Sonja TSCHUMPEL, Irene K. LICHTSCHEIDL: Institute of Ecology and Conservation Biology, University of Vienna.

We investigate the traps and the trapping mechanisms of *Utricularia* and compare aquatic and terrestrial species. Traps appear to function with the same mechanisms, although they differ slightly in their morphology regarding glands and trigger hairs, i.e. the trap door is activated by mechanical stimuli coming from the animals. Very often, however we observe also inorganic and non-moving material within the bladders. This suggests autonomous opening of the trap doors without external stimuli. We analyse the triggered and non-triggered activation of the traps by immersion into coloured fluids and we observe the absorption of the dyes. In addition, we show the process of suction of animals into the bladders in time-lapse cinematography.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Keynote lecture 4: Sunday 20th June 2004, 9:00 - 9:45

Sumatra – a centre of evolution in the genus Nepenthes?!

Dr. Joachim NERZ

If you asked botanists before some years, where to find the highest degree of species-diversity or most of the species in the genus Nepenthes, usually they answered Borneo. In recent years, many of these botanists changed their opinion, due to recent discoveries in the last 10-15 years. To the ‚classic' Sumatran species of the ‚Montanae-group' new and oftenly spectacular species could be added, like the unique *N. aristolochioides* or *N. jaquelinae*, but also others, like *N. talangensis*, *N. ovata, N. diatas, N. mikei, N. longifolia, N. adnata and N. tenuis*. It seems, that the mountain axis along Western Sumatra, the so called Barisan-range and the mountains around and North of the Toba-area, are an ideal range for species-development in the family of Nepenthaceae. A range of many mountains, not very far from each other, but far enough, to make it difficult but not absolutely impossible for Nepenthes-seed to spread from one mountain to another. It is obvious, that widespread mountain species like *N. singalana N. bongso or N. gymnamphora* developed over the time minute, but distinct characteristics of the population at each different mountain-top. It is a good example, that the definition of a species in the plant-kingdom is by far more complex and depending on the opinion of the author, than in the animal kingdom, where you usually can say, if two populations cannot cross, they are two different species. The genus Nepenthes is a good example, that these criteria are in the botanical world not valid. Gardeners can cross all species, one with another without a problem & also in nature you can find quite regularly natural hybrids; but usually just with few single adult specimens. A good example for these species-development is e.g. *N. singalana*: In Western Sumatra, each mountain bear a distinct ‚form', so e.g. the typical one from G. Singgalang or G. Merapi is quite large and robust, the ones from the nearby G. Mantalingajan are gracile without real climbing stems and so on. In the Northern part of Sumatra, the difference to the ‚typical' *N. singalana* is so obvious, that Jebb and Cheek described it as a distinct species*: N. diatas*. The same in the Southern part of Sumatra, where the next relative to *N. singalana is N. spathulata*. The same e.g. with *N bongso*, in Western Sumatra still variants of one species, differing slightly from mountain to mountain, in the Northern part they develop distinct species, related to it, like e.g. *N. ovata or N. densiflora*. Besides these common species highly specialized species like the ‚flypaper-like' *N. inermis or N. dubia*, the ‚light-trap' *N. aristolochioides* or the species with a colourful airstrip for insects, *N. jaquelinae* can be found. Many of these species are currently known only very locally, oftenly just from a single ridge. In these species, the ‚bridge' to the next relatives is not so obvious, but usually, they exist. So it is e.g. quite obvious, that one of the extreme specialists*, N. aristolochioides* has its next relative in *N. talangensis*. But not just the Barisan-range bears quite interesting species. The Tjampoo-mountains, for example, in Western Sumatra are not of vulcanic origin; the ground is sandstone or limestone. These hills are just about 1000 m in altitude, but in recent years, 2 very interesting and distinct species could be described of this area: *N. adnata*, which shows many similarities to *N. tentaculata* of Borneo and Sulawesi, but which seems to be not nearly related to it and the strange *N. tenuis,* a tiny species, which seems to be restricted to a single ridge in the huge area of the Tjampoo-mountains. *N. tenuis* shows many characteristics of a Sumatran highland-species (Jebb & Cheek even united it with *N. dubia*), but it is growing at a low

forest ridge at just 1000 m alt. .These examples will give an impression, how vivid the development of Nepenthes-species is active in the highlands of Sumatra.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Sunday 20th June 2004, 9:45 - 10:15

Asian mainland *Nepenthes*

Dr. **Heiko RISCHER**

This slide show will follow the path of two expeditions to Singapore, Peninsular Malaysia and Thailand in search for *Nepenthes*. Starting from the south the following species were encountered:
N. ampullaria, *N. rafflesiana*, *N. gracilis*, *N. sanguinea*, *N. ramispina*, *N. macfarlanei*, *N. gracillima*, *N. albomarginata*, *N. benstonei* and *N. anamensis* plus hybrids and uncertain taxa. A main focus of the talk will be not only to show the pitcher plants themselves but also the interesting lowland or highland habitats with the accompanying flora. Specifically several species of the closely related but non-carnivorous Ancistrocladaceae will be mentioned. Besides rather well known *Nepenthes* locations like the Genting Highlands near Kuala Lumpur some rather remote places have been visited, too, e.g. Gunung Benom (2107 m) in the Pahang State of Malaysia which can be only accessed with a special permit. Special attention will be paid to the very unusual seasonal habitat of *N. anamensis* in the northeast of Thailand an area rarely visited by *Nepenthes* enthusiasts.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Sunday 20th June 2004, 10:15 - 10:45

Nepenthes and its food Web

YueJin HUA,·Jin Hai-an Middle school Zhuhai Guangdong China·519041
Keywords: ecology: animal interactions -- observations: China, *Nepenthes mirabilis*.

After eight years of careful observation of nepenthes in the valleys of Zhuhai, Guangdong Province, People's Republic of China, we have taken many pictures and video recordings, which show the mysteries of nepenthes. Here is the observation of the complicated food webs and relationships between nepenthes and some of its ambient small organism.

1. Brief introduction of Zhuhai, where nepenthes grows;
2. **Relationship between nepenthes and ants;**
2.1."Alluring honeydrop"----the skill nepenthes catches ants;
2.2. Ants pollination onto nepenthes;
2.3. Ants as baits for nepenthes to catch food;
2.4. Nepenthes' amphiphilic digestive juice;
3. Relationship between nepenthes and wasps;
3.1. Process of nepenthes catching wasps;
3.2. Mechanism of nepenthes catching wasps;
3.3. Wasps that nepenthes fail to catch;
3.4. Wasps catch worms on nepenthes' leaves;
4. Relationship between nepenthes and mosquitoes;
4.1. Nepenthes capture mosquitoes;
4.2. Nepenthes' digestive juice feeds mosquitoes;
5. Relationship between nepenthes and locusts;
5.1. Locusts eat nepenthes;
5.2. Nepenthes capture locusts;
6. Relationship between nepenthes and spiders;
6.1. Spiders capture insects on the entrance of the pitcher;
6.2. Nepenthes capture spiders;
7. Relationship between nepenthes and lizards;
7.1. Nepenthes capture lizards;
7.2. Lizards catch insects on nepenthes;
8. Relationship between tree frogs and nepenthes;
8.1. Tree frogs freely jump into and out of the pitchers of nepenthes;
8.2. Tree frogs as parasites in the pitcher of nepenthes;
8.3. Tree frogs can bear the sour juice (pH=2) in the pitcher;
9. Nepenthes' captured creatures;
10. An analysis of the ecology significance of nepenthes and its food web;
10.1. Food chain and food web constructed between nepenthes and its ambient small organism;
10.2. Relationship between nepenthes and its ambient small organism:
captures; competition; parasitism; mutualism and altruism;
10.3. Cause of formation of nepenthes' food web;
10.4. Crisis of nepenthes' present existent status;
10.5. Courses of the crisis of nepenthes in Zhuhai City:
10.6. Significance of the protection of nepenthes
11. Photos of students observing nepenthes;

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Sunday 20th June 2004, 11 :15 - 11 :45

Diversity of mechanisms involved in insect capture in *Nepenthes* of South-East Asia: functional, ecological and evolutionary aspects

Laurence GAUME[1], Bruno DIGIUSTO[1], Elodie FARGEAS[1], Philippe PERRET[2], Jean-Jacques LABAT[3], Elena GORB[4], Stanislav GORB[4] and Nick ROWE[1]

[1] Botanique et bioinformatique de l'architecture des plantes, Montpellier, France
[2] Centre d'Ecologie Fonctionnelle et Evolutive – CNRS, Montpellier, France
[3] Conservatoire des plantes carnivores, Nature et Paysages,Peyrusse-Massas, France
[4] Evolutionary Biomaterials Group, Department Prof. Dr. E. Arzt, Max Planck Institute for Metals Research, Stuttgart, Germany

The *Nepenthes* pitcher plants count at least 86 species, most of which are found in South-East Asia. The morphological diversity of the pitchers has for long time fascinated naturalists as well as collectors. Their passive traps capture many arthropods that provide, through the digestive process, an essential nitrogen supply. Their trapping efficiency greatly relies on slippery surfaces responsible for insect fall and retention inside the pitcher. The different surfaces of the pitcher have diverse textures, which vary not only within a pitcher but also within the genus. The goal of the present work was to measure the impact of this micro-architectural diversity on the trapping mechanisms within the genus *Nepenthes*. Studies of biomechanics and behavioural ecology have been carried out on three species of *Nepenthes* (*N. alata*, *N. 'ventrata'* and *N. rafflesiana*) in the laboratory or in the field. These studies were first aimed at assessing how the pitcher surfaces interact with insect locomotion and attachment. They were further carried out in order to test whether, beside purely physical mechanisms, chemical and physical-chemical processes might also be involved in the insect trapping ability. We showed that, within the *Nepenthes* genus, the trapping mechanisms involve characters, which are diverse and crucial, such as the attractive odours of the peristome, the slippery epicuticular wax of the pitcher and the retentive function of the pitcher fluid. Such a study, when replaced in the context of existing phylogenies, should allow to track the patterns of apparition and evolution of key characters for capture and carnivory in *Nepenthes* species.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Sunday 20th June 2004, 11:45 - 12:15

Early Cretaceous Sarraceniacean Pitcher Plants From Western Liaoning of China

Hongqi LI[1], Fuqing SONG[2], Huitong WANG[2], Shuichang ZHANG[2], Robert LARIVEE[3], and Jan SCHLAUER[4]

[1]Department of Biology, Frostburg State University, Frostburg, MD 21532, USA.
[2]Key Laboratory of Petroleum Geochemistry, National Petroleum Corporation, Beijing 100083, China;
[3]Department of Chemistry, Frostburg State University, Frostburg, MD 21532, USA;
[4]Institute of Plant Biochemistry, University of Tuebingen, Tuebingen, Germany.

With the carnivorous pitchers and beautiful flowers, sarraceniacean plants are found with three genera separately distributed in South and North America. They are considered neither related to the monospecific Cephalotaceae in Australia, nor the monogeneric Nepenthaceae in the Old World tropics (including southern China). For lacking fossil record, whether sarraceniacean genera originated from South Africa or alternately within North America has been uncertain. Here we report the first fossil sarraceniacean plant, *Archaeamphora longicervia*, from the Jianshangou Formation, Low Cretaceous, at Beipiao, western Liaoning, China. The plants are herbaceous and similar to modern *Sarracenia purpurea* to some extent in having spirally arranged pitchers and phyllodia-like tubular leaves with parallel major veins. They can be reconstructed together with intimately associated seeds that are reticulate-tuberculate and winged, morphologically resembling the seeds of *Sarracenia* the most. Furthermore, using GC-MS we have found the fossil molecular peak with oleanane in the extracts that were directly leached from three fossil pitcher samples. The extracts were then treated with zeolite molecular sieve to remove non-oleanane isomers and thus confirm the existence of oleanane through GC-MS analysis again. Oleanane has been considered to be a biomarker of angiosperms, and it has not been found in extant gymnosperms. Several other fossil and sedimentary samples collected from the same site were also analyzed, but no oleanane has been found yet. The existence of fossil molecule oleanane suggests the fossil plants should belong to angiosperms rather than gymnosperms, while the unique pitcher structure and characteristic sarraceniacean seeds lead to a comparison to sarraceniacean plants. *Archaeamphora* demonstrates the oldest, and the only fossil record of sarraceniacean plants. China does not have living sarraceniacean plants, but very few species of Nepenthaceae. Obviously, this fossil record from China provides us significant data in study of the origin, evolution, and phylogenetic relationships of pitcher plants.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Sunday 20th June 2004, 12:15 - 12:45

Glands of carnivorous plants as a model system in cell biological research

Wolfram ADLASSNIG[1], Ingeborg LANG[1], Peter HEPLER[2], Irene K. LICHTSCHEIDL[1]

(1) Institute of Ecology and Conservation Biology, University of Vienna, Vienna, Austria
(2) Research Professor of Biology, University of Massachusetts, Amherst, USA

We use glands of carnivorous plants as models to investigate the cyto-architecture and the physiology of secreting and absorbing plant cells. Therefore we apply life cell microscopy, i.e. video enhanced light microscopy, ultraviolet microscopy and fluorescence microscopy and combine it with electron microscopy of cryofixed material. In *Drosera*, *Byblis*, *Pinguicula*, *Nepenthes* and *Aldrovanda* we show the morphology and the cyto-architecture of the gland cells. We analyse the Golgi apparatus and its vesicles during formation and secretion of trapping mucilage, the endoplasmic reticulum producing digestive enzymes, endocytotic vesicles during digest uptake and the movement of organelles along the cytoskeleton. These observations improve our understanding of the structure and function of carnivorous plants in particular; in addition, they advance our general conception of the cell biology of plant glandular cells.

Keynote lecture 5: Sunday 20th June 2004, 14:15 - 15:00

Carnivorous Plant Chemistry

Priv.-Doz. Dr. **Jan SCHLAUER**

Plants are known to produce a large array of compounds that are not ubiquitously distributed in living organisms. These secondary metabolites have frequently been assumed to serve particular purposes in metabolic or developmental regulation, the specific attraction of pollinators, pathogen antagonists, or prey (in carnivorous plants), in the defense against pathogens, the repulsion of competitors, and conceivably in a vast amount of yet unknown fields.

Carnivorous plants are an ecologically and not in the first line a phylogenetically defined group. So it cannot be expected that their secondary metabolism is homogenous, even if parts of their primary metabolism (acquisition of nutrients from animal prey) shows obvious parallels. In contrast, among phylogenetically allied organisms, secondary metabolites are frequently similar, and carnivorous plants do follow this trend.

The order Nepenthales is chemically characterized by the widespread occurrence of acetogenic quinones of the plumbagin type and by the lack of betalain pigments that characterize their sister group Caryophyllales. Plumbagin or its regioisomer 7-methyljuglone has been detected in all nepenthalean genera of carnivorous plants (*Dionaea*, *Aldrovanda*, *Drosera*, *Nepenthes*, *Drosophyllum*, *Dioncophyllum*).

Cephalotus is placed in Oxalidales (a Rosid order) but no characteristic ingredient of Oxalidales has been detected in *Cephalotus* (a genus that is not well known chemically) to date.

Iridoids are characteristic monoterpenes that are almost exclusively found in subclass Asteridae. Quite expectedly, iridoids have been found in all asterid carnivorous plants (Sarraceniaceae, Byblidaceae, Lentibulariaceae) and in the respective subcarnivorous relatives (Roridulaceae, Martyniaceae).

The alkaloid coniine has been isolated from Sarracenia, and it is supposed to be the insect-stunning principle of Sarraceniaceae. Coniine is also known from the remotely related poison hemlock (*Conium maculatum*, Apiaceae), and structurally similar piperidine alkaloids are known from pine species (*Pinus*, Pinaceae). Coniine is the only substance acutely toxic to man that is known from carnivorous plants so far.

The caffeic acid ester acteoside is a characteristic metabolite of the order Scrophulariales, and it has been known as an ingredient of Lentibulariaceae and Martyniaceae (undisputed members of Scrophulariales). The recent detection of acteoside in Byblidaceae corroborates a hypothesis that places Byblidaceae in Scrophulariales based on genetic comparison.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Sunday 20th June 2004, 15:00 - 15:30

Vegetative reproduction in Australian sundews

Douglas DARNOWSKI, Indiana University SE, New Albany, Indiana 47150, USA

Many Australian sundews reproduce vegetatively in several unusual ways when compared with non-Australian sundews. In particular, tuberous sundews produce short storage shoots underground, and pygmy sundews convert their stipules into gemmae. Information will be presented on the study of the formation of the structures with regard to the roles of cytokinins and KNOTTED-like genes in their production. For tuberous sundews, information will be included on both normally-produced tubers as well as the leaf tubers which are produced both in nature and in cultivation when tissues basal to glandular hairs convert to tubers.

5th World Carnivorous Plant Congress
LYON 18th-21st June 2004

Sunday 20th June 2004, 16:30 - 17:00

Découverte de *Nepenthes edwarsiana* au Marai Parai

Romuald ANFRAIX

Write-up of a travel on the search for *Nepenthes edwarsiana*, which occurred in April 2003.

Observation:

-The plants is present in small number in the area known as "Marai Parai" on the slopes of Mt. Kinabalu. They are located at the top on the saddle between two hills, with the very steep slopes which does not allow correct exploration of the zone. Only a small part can be visited, and it is there that we discovered three sites with plants. The plants climb up to the canopy, the size of the traps appeared impressive: close to 30 cm high.

-The texture of the trap remained very flexible, including the prominent rings of the peristome, whose only low zone, carrying digestive glands was rigid. More surprising was the white colour of the inside of the trap which contrasts with the outside red. The plants did not seem anymore to be regenerated by sexual reproduction: neither male or female floral stalk, nor young seedlings; only adult plants, looking obviously identical, which let think that maybe these plants represented only one individual which would have been naturally layered.

Sunday 20th June 2004, 15:30 - 16:00

Report of a high-latitude population of *Sarracenia purpurea* ssp *purpurea* growing on poisonous deep mantle rocks.

Fabio D'ALESSI, Department of Biology, University of Padua, Padova, Italy

During a recent trip to Canada, several populations of *Sarracenia purpurea* ssp *purpurea* were visited in the regions of Ontario (Great Lakes) and Newfoundland.

During the travel through Newfoundland a population of pitcher plants was found on a vegetation-less area where the soil is almost purely composed by deep mantle rocks which are known to be poisonous to vegetal life.

In this area only a dozen species of superior plants can withstand the severe geological conditions and the climatic extremes. All of these species show stunted growth and display evident signs of physiological suffering. The only species showing good growth and spread were three insectivores belonging to the *Drosera*, *Pinguicula* and *Sarracenia* genera.

In this speech *Sarracenia purpurea* ssp *purpurea* is dealt with in a specific way, with impressive images showing how this species adapted to the habitat conditions: almost no in-soil organic deposits, poisonous rock composition, extreme low temperatures and minimal water. The adaptations of such a population clearly stress the adaptability and plasticity of *Sarracenia purpurea purpurea*, making it easier to understand its wider geographical distribution, compared to the other *Sarracenia* taxa.