morphology and anatomy in 22 species. Our molecular phylogenetic data are largely congruent with data on the same DNA region produced by Shimai & Kondo (2004), although they studied only 21 species. We suggest that cotyledon number was quite unstable in the evolution of Pinguicula. Some features of seed coat structure and flower morphology are much more congruent to nrITS phylogenetic data than cotyledon number.

P1721. Complex organisation of the waxy zone in pitchers of Nepenthes alata Blanco (Nepenthaceae)

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The waxy zone inside pitchers in most Nepenthes species is covered with a thick layer of epicuticular wax and was reported to serve mainly for animal trapping and retention. In N. alata, two layers of waxes are distinguished. These layers differ in their structure, chemical composition and mechanical properties, and they decrease the attachment of insects in different ways. The lower layer is composed of highly interconnected irregular platelets, whereas the upper one consists of densely arranged separate membraneous platelets bearing a pedicel-like "foot". These morphological distinctions are caused primarily by differences in the chemical composition of waxes. The waxes exhibit different mechanical properties: the wax of the lower layer is harder and stiffer than that of the upper layer. Moreover, crystals of the upper layer are very brittle and may be easily detached or broken to tiny pieces. The laboratory experiments showed that both wax layers reduce the attachment force of insects. Both layers lead to the reduction of the contact area of insects' feet with the plant surface. Additionally, crystals of the upper layer contaminate insects' adhesive organs.

P1722. The behaviour of *Drosera rotundifolia* L. (Droseraceae) trapping leaves in natural habitats

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Our aim was to investigate the influence of weather conditions and prey on the leaf-trapping behaviour of insectivorous plant *Drosera rotundifolia* (Droseraceae) in the natural habitat.
Continuous, non-manipulative observations on two sundew plants in Northern Russia and two plants in Middle Russia lasted 72 hours each. We estimated the shape of the leaf blade, the degree of slime secretion, percentage of curved margin tentacles and the number of captured prey for each of sixteen leaves chosen for the study.
Our observations show that different characteristics of leaf blade changed independently both on each other and on the presence of prey. The correlated behaviour of leaf blades from different plants also indirectly shows the absence of dependence between trapping leaves behaviour and prey. However, our experiments with artificial feeding in natural conditions show clear leaf reaction to the prey.
We propose that in natural undisturbed conditions changes of the leaf blade characteristics are casual and are augmented by the external factors such as relative air humidity, atmosphere pressure and presence of the prey on the leaf blade.

P1723. Respiration study in aquatic carnivorous plants: turions, traps and leaves

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Respiration at 4 and 20^{o}C was compared in dormant autumnal turions of aquatic plants *Hydrocharis morsus-ranae* and *Caldesia parnassifolia* and aquatic carnivorous plants *Aldrovanda vesiculosa, Utricularia australis, U. ochroleuca* and *U. bremii* and after breaking imposed dormancy in the spring. Respiration rate at 20^{o}C was 1.3-4.6 mmol/kg$_{FW}$.h in dormant turions and slightly increased (1.7-5.2 mmol/kg$_{FW}$.h) in the spring. However, non-dormant "turions" of (sub)tropical Australian *Aldrovanda* populations and American temperate *Utricularia inflata* and *U. purpurea* respired 7.6-11.3 mmol/kg$_{FW}$.h. Respiration rate of traps of 6 temperate aquatic *Utricularia* species (5.1-8.6 mmol/kg$_{FW}$.h) was 70-120 % greater than that in leaves or shoots. But net photosynthetic rate in photosynthetic leaves/shoots (40-117 mmol/kg$_{FW}$.h) exceeded that in traps by 7-10 times. Thus, *Utricularia* traps represent a great metabolic cost for the plants.

P1724. Carnivory Timed to Flowering in Triggerplants (Stylidium; Stylidiaceae)

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Australia's Triggerplants (Stylidium spp.; Stylidiaceae) 1) share habitat (wet, low nutrient soils) with accepted genera of carnivorous (Drosera, Utricularia, Cephalotus) and subcarnivorous/protocarnivorous (Byblis) plants and 2) possess glandular hairs which trap insects. Several lines of evidence were found to support the hypothesis that triggerplants are carnivorous: 1) trapping rates (prey m-2) for triggerplants and for accepted genera of carnivorous and subcarnivorous plants were very similar at three sites separated by 1500 km; 2) triggerplants, like Drosera capensis and unlike non-carnivorous plants, produced proteases in an inducible fashion when prey-trapping was simulated using yeast extract. This was true for plants flowering on soil as well as for plants flowering in vitro, the latter possibility excluding digestion by microorganisms on the plant surface. Therefore, triggerplants are carnivorous. It is very interesting that this carnivory is timed to just before and during flowering.

P1725. Photosystem-II damage and repair cycle in chloroplasts

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The mechanism of a photosystem-II (PSII) damage and repair cycle in chloroplasts will be discussed. Photo-oxidative damage to the PSII reaction center occurs in every organism of oxygenic photosynthesis. An elaborate repair mechanism has evolved that rectifies this irreversible photoinhibition and restores the PSII charge separation activity. The repair entails several enzymatic reactions for the selective removal and replacement of the inactivated D1/32 kD reaction center protein (the chloroplast-encoded psbA gene product) from the massive (>1,000 kD) water-oxidizing and oxygen-evolving PSII holocomplex. Evidence will be presented for the conformational status of PSII during D1 turnover. The composition of a PSII repair intermediate that occurs in the thylakoid membrane will also be discussed. This repair process is unique in the annals of biology; nothing analogous in complexity and specificity has been reported in other systems. Elucidation of the mechanism may reveal hitherto unknown reactions for the selective replacement of a protein from within multi-protein complexes. This may have applications in agriculture, medicine and other fields.

P1726. Impact of long-term salinity and oxidative stress on photosynthesis, growth, cellular antioxidants and medicinal quality of *Artemisia annua* L.

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In plants, salinity alters osmoregulation, ionic balance, stomatal behavior, photosynthetic rate and oxyradical generation. In response, plants try to cope with them by strengthening the cellular antioxidant system and status of osmolytes. We studied impact of the long-term salinity and oxidative stress on photosynthesis (P_n), growth, cellular antioxidants, proline and medicinal quality of *Artemisia annua* L. which yields artemisinin, effective against both drug-resistant and cerebral malaria-causing strains of *P. falciparum* and the cancer. Under salinity, *A. annua* showed reduced P_n and biomass accumulation. Contents of TBARS, proline, GSSG, DAs and activities of SOD, APx and GR increased but GSH and As declined. Artemisinin content increased initially (98%; 160 mM NaCl) but declined with progression of time. Thus, salinity causes oxidative stress in *A. annua*, reducing P_n, growth, Asc and GSH but increased contents of proline and glutathione (GSH+GSSG), and activities of antioxidant enzymes provide a certain level of tolerance. An increase in artemisinin content might be due to rapid conversion of its precursors by oxyradicals into artemisinin.