



Structure and biology of cactus shoots (Invited Review)

Mauseth (pp. 901–926) reviews the diverse morphology, development, ecology and flowering of cacti. Numerous features appear to be compensatory adaptations, e.g. loss of leaves to reduce transpiration; restricted branching by means of decreased apical meristem number to accommodate heavy succulent stems. Many cacti are shown to be adapted to non-xeric habitats.



Summer dormancy in perennial temperate grasses (Review)

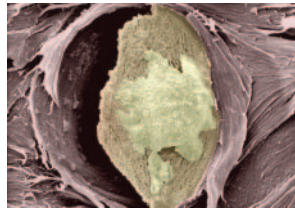
Volaire and Norton (pp. 927–933) review characteristics of summer dormancy in Mediterranean grasses experiencing regular intense summer drought. The trait is shown to be expressed under increasing photoperiod and temperature. Based on assessments under summer irrigation, a terminology is proposed that will aid development of new perennial grasses to cope with increasing aridity.



New relationships between wild and cultivated olives

Relationships between different forms of olive are unclear. Micro-scale

evaluations of the genetic structure of wild and cultivated olive tree populations allow **Baldoni *et al.* (pp. 935–942)** to show that in some regions all cultivars have been introduced from the outside, while in other regions some cultivars probably originated from local oleasters.



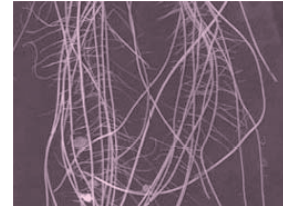
Unusual pit membrane thickenings in the Ericales

In contrast to gymnosperm wood, most angiosperms show a homogeneous pit membrane structure in their tracheary elements. Based on LM, SEM and TEM, **Rabaey *et al.* (pp. 943–951)** reveal pit membranes in narrow conductive elements of some Ericaceae with thickenings associated with plasmodesmata. These ‘pseudo-tori’ differ considerably from pit membranes with true tori.



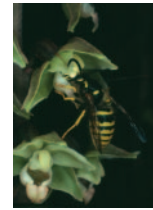
Accessory branch initiation in *Lotus*

Throughout its life, *Lotus japonicus* develops many shoots at the cotyledonary node. **Alvarez *et al.* (pp. 953–963)** describe the origin, initiation and development of these meristems. Studies of morphology, histology and *in situ* mRNA analyses demonstrate that groups of cells, continuously maintained in a meristematic state, coincide with the sites where accessory meristems form.



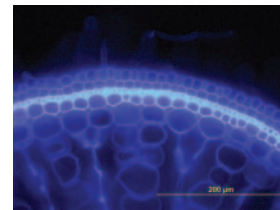
14-3-3 gene expression in tomato roots in response to stress

Using real-time RT-PCR, **Xu and Shi (pp. 965–974)** analyse expression patterns of the entire 14-3-3 gene family in response to salt stress, potassium and iron deficiencies in tomato roots. 14-3-3 proteins appear to play key roles in the appropriate stress-related signalling pathways.



Epigenetic factors affect flower size in orchids

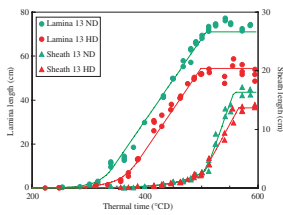
Bateman and Rudall (pp. 975–993) explore rarely tested assumptions regarding variation in flower size within individual inflorescences. Typically, 75 % of the variation in flower size within an orchid population can be ascribed to epigenetic rather than genetic factors. This finding holds profound implications for morphometric and microevolutionary studies.



Rice responses to low O₂

Rice roots adapt to O₂ deficiency by developing more aerenchyma to enhance longitudinal O₂ entry. **Insalud *et al.* (pp. 995–1004)** show an associated induction of a barrier to restrict radial O₂ loss within 1 d of waterlogging. Even with these acclimations for improved internal aeration, sudden

loss of root-zone O₂ adversely affects P nutrition.



Asynchrony between lamina and sheath extension regulates leaf length response to plant density

Andrieu *et al.* (pp. 1005–1016)

examine the kinetics of leaf extension in maize and show that reduced length of upper leaves at high plant density is related to slower exponential growth of the laminae and a delayed onset of their linear extension, while the timing of early sheath development remains unchanged.



Genetic structure in aquatic bladderworts

Reliance on clonal reproduction is common amongst aquatic angiosperms.

Kameyama and Ohara (pp. 1017–1024) reveal that hybrid populations of a sterile F₁ hybrid (*Utricularia australis* f. *australis*) have been maintained exclusively by clonal propagation since it originated sometime in the distant past. Accordingly, genotypic diversity within populations is extremely low.



Genetic structure of *Galitzkya* spp. in Mongolian mountains

Mountains provide extreme, often strongly isolated habitats. In mountain populations

of *Galitzkya potaninii*, Wesche *et al.* (pp. 1025–1034) find that genetic exchange is strongly limited, raising concern for its conservation. In contrast, the Mongolian endemic *G. macrocarpa* shows only modest isolation by distance. Recruitment of this species is mainly sexual, but clonal growth allows survival under unfavourable conditions.



Co-occurrence of multicopper oxidases tyrosinase and laccase in lichens

Lichens in the suborder Peltigerineae possess strong extracellular laccase activity.

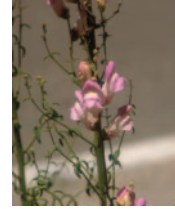
Laufer *et al.* (pp. 1035–1042) now demonstrate the presence of a second extracellular multicopper oxidase (tyrosinase) in these lichens. This is unusual since tyrosinase activity is shown to be low or absent in other lichens.



Clonal integration influences habitat selection and photochemical efficiency

Roiloa and Retuerto (pp. 1043–1052)

examine how physiological and morphological responses of *Fragaria vesca* to soil heterogeneity influence the placement and growth of ramets. Benefits of clonal integration include greater photochemical efficiency and a better integration of heterogeneous environments. This allows comparable biomass to be achieved despite lower total resources being available.



Genetic variation and its partitioning in *Antirrhinum siculum*

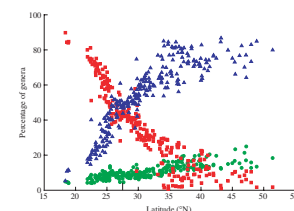
Mateu-Andrés and de Paco

(pp. 1053–1060) examine 851 individuals from 49 natural populations of *A. siculum* using 13 allozyme loci. Correlations are shown between levels of diversity and their partitioning, and the reproductive system. These findings are helping to formulate conservation strategies.



Clonality and genetic structure of *Santalum insulare*

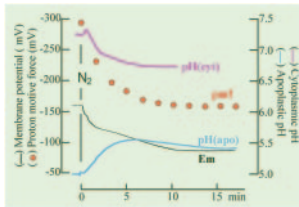
Genetic diversity of *Santalum insulare*, a sandalwood species of French Polynesia, is analysed by Lhuillier *et al.* (pp. 1061–1072). Microsatellite markers reveal high clonality within populations, low diversity within each island and strong differentiation between archipelagos. These results allow the delineation of management units to help start a conservation programme for this threatened species.



Plant geography of China

Using a comprehensive dataset comprising 290 floras from across China, Qian *et al.* (pp. 1073–1084)

analyse the composition of floristic elements at multiple spatial scales (i.e. national, provincial and local) and explore the extent to which climatic and geographic factors associated with each flora can jointly, or independently, explain the variation in the floristic elements of local floras.



Apoplastic pH and low-oxygen stress

Energy-rich compounds must pass the apoplast before being transported into cells via proton co-transporters for storage or metabolism. Using pH microprobes, **Felle (pp. 1085–1093)**

shows that anoxia strongly increases apoplastic pH and depolarizes plasma membranes. This suggests that anoxia tolerance of plants depends on the ability of the affected tissues to deal with this drain in proton motive force.



Adaptations to burial in coastal sand dunes

Dech and Maun (pp. 1095–1105) show that adventitious root production on stems and shifts in allocation to stimulate shoot extension and re-emergence are typical reactions of woody species to sand burial in coastal dunes of central

Canada. The likely adaptive value of these responses is assessed.



Wooden remains as ice-age genetic archive (Technical Article)

Wooden remains are frequently found in paleobotanical and archaeological studies. They are used to reconstruct biological processes and human activities during the last glacial cycle. **Liepelt et al. (pp. 1107–1111)** test the possibility of using such remains as a genetic archive of past populations. Convincing evidence is presented for the successful retrieval of authentic DNA from samples up to 1000 years old.