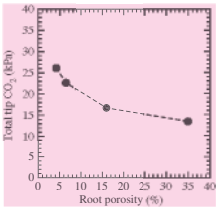
Content*Snapshots*

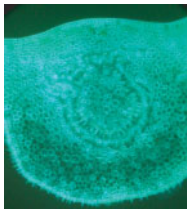
Enigma variations for peptides and their transporters (Botanical Briefing)

Given the metabolic complexity of plants there is great potential for peptides and their transporters to play multiple physiological roles. **Waterworth and Bray** (pp. 1–8) implicate peptide transporters in nitrogen nutrition and in the regulation of growth and development. There is often a totally unexpected substrate for these transporters.



Carbon dioxide and soil waterlogging (Invited Review)

Carbon dioxide accumulates in waterlogged soil. Its effect on plants needs further exploration (**Greenway *et al.*, pp. 9–32**). Modelling shows that although aerenchyma would facilitate ventilation of CO_2 from the roots, tolerance of metabolism to high CO_2 would still be required. The few data available indicate species may differ in this characteristic.

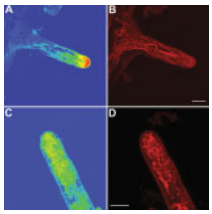


Caffeoylquinic acids in developing leaves of coffee

Little is known about caffeoylquinic acid in *Coffea canephora* leaves. **Mondolot *et al.* (pp. 33–40)** determine its concentration and histolocalization during leaf development. They show a close connection with chloroplasts, mobilization via phloem and an involvement in lignification. The significance of a similar pattern of distribution for caffeine is discussed.

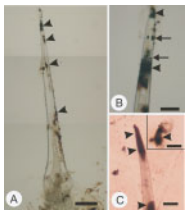
First image of *Cucurbita* in Europe

Cucurbita (pumpkin, squash, gourd), a New World genus, arrived in the Old World after 1492. A prayer book illustrated between 1503 and 1508 for Anne de Bretagne, Queen of France, contains paintings of >300 plant species. One of them, the earliest known depiction of *Cucurbita* in Europe, is identified by **Paris *et al.* (pp. 41–47)** as *Cucurbita pepo* subsp. *texana.*



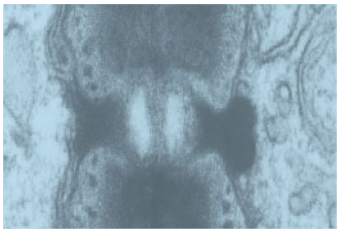
Distribution of G-actin is related to root hair growth

Actin distribution in root hair tips is controversial. **He *et al.* (pp. 49–55)** show that a tip-focused gradient of intracellular G-actin at the extreme apex may be essential for root hair growth in wheat and that a high internal Ca^{2+} concentration is needed to maintain it.



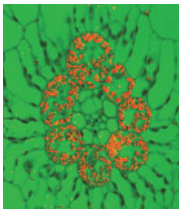
Novel nettle toxins induce lasting pain

The cause of irritation and wheals by stinging hairs of *Urtica* spp. (stinging nettles) has remained unresolved until now. **Fu *et al.* (pp. 57–65)** examine nettle toxins and identify, for the first time, oxalic acid and tartaric acid as major long-lasting pain-inducing toxins in the stinging hairs of *U. thunbergiana*.



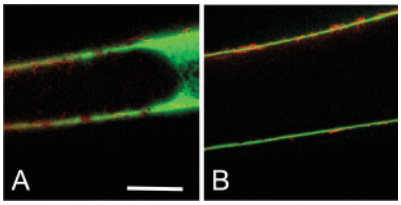
Desiccation tolerance linked to cytological features in mosses

Links between desiccation tolerance and desiccation-induced depolymerization of microtubules, deposition of additional cell wall material and plugging of plasmodesmata in food-conducting cells are explored by **Pressel *et al.* (pp. 67–76)**. These changes are shown to be reversed by rehydration and may have hitherto unrecognized key roles in desiccation biology.



Structure and function of PEP-CK type C_4 photosynthesis

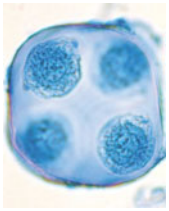
One of the C_4 cycles that concentrates CO_2 around Rubisco in C_4 photosynthesis utilizes phosphoenolpyruvate carboxykinase. This type of C_4 cycle is restricted to the Poaceace where it has a polyphyletic origin. **Voznesenskaya *et al.* (pp. 77–91)** study functional and structural relationships of representative species and present schemes for the bioenergetics of carbon assimilation.



Wall assembly under pressure

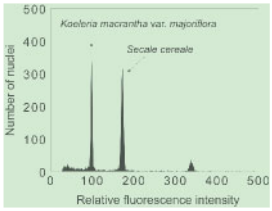
After finding that turgor pressure affects wall deposition in the periplasm, **Proseus and Boyer (pp. 93–105)** study polysaccharides exposed to turgor in artificial periplasm. They find the

polysaccharides (green) are dilute at low turgor (A) but concentrated at normal turgor (B) where certain polysaccharides begin to enter the wall (red) and wall pectins begin to gel.



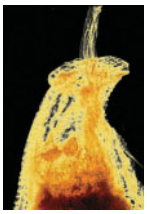
Pollen of the caesalpinioid legume *Duparquetia*

An encircling ectoaperture and two endoapertures make pollen of *Duparquetia* unlike that of other tricolporate eudicots. Using confocal imaging, **Banks *et al.* (pp. 107–115)** show that *Duparquetia* pollen resembles pollen of other legumes in terms of development and aperture orientation.



Genome size variation is an aid to taxonomy

Knowledge of ploidy, chromosome number and genome size may assist taxonomic treatment when phenotyping is inadequate. **Pecinka *et al.* (pp. 117–122)** examine these characteristics within a taxonomically critical grass genus and show that they can be used for identification of morphologically similar taxa. For two taxa, intra-specific variation in genome size is revealed.

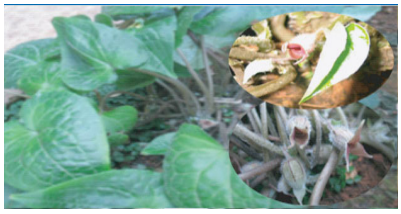


Ephedra (Gnetales)—living fossils?

Fossil seeds with preserved cellular details and *in situ* pollen demonstrate the presence of unique *Ephedra* features in the Early Cretaceous. Using seed from Portugal and North America, **Rydin *et al.* (pp. 123–140)** reveal that key reproductive characters and pollen germination processes have remained unchanged within the seed plant group *Ephedra* for at least 120 million years.

Phylogenetics of *Papaver* and related genera

Papaver, Meconopsis, Stylomecon and *Roemeria* form one of two clades within the Papaveroideae. DNA sequencing by **Carolan *et al.* (pp. 141–155)** indicates that *Papaver* is not monophyletic unless *Roemeria, Stylomecon* and *Meconopsis cambrica* are included. *Argemonidium* and *Meconella* are seen as distinct from *Papaver s.s.* and a number of morphological characters have arisen in parallel.



Floral genes of *Asarum caudigerum* (Aristolochiaceae)

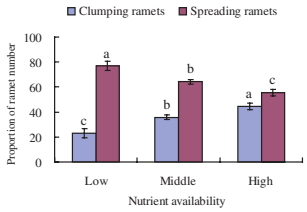
To help understand the origin and evolution of angiosperm flowers, **Zhao *et al.* (pp. 157–163)** examine florally related genes of this important paleoherb. Analysis of MADS-box transcription factors suggests that *A. caudigerum* may have originated shortly after the divergence of angiosperms and gymnosperms.

Spatial genetic structure in a clonal species

Using ISSR markers, **Chung *et al.* (pp. 165–173)** identify a number of genets from the total sample including clonal ramets within two populations of *Echinosophora koreensis* and examine fine-scale genetic structure (FSGS) for both genets and total samples. A strong FSGS from genets is consistent with bee pollination and limited seed dispersal.

Leaf area responses to drying soil in grapevine

Lebon *et al.* (pp. 175–185) find that organogenesis, morphogenesis and gas exchange are inhibited by soil water deficit in an intensity-dependent manner with sensitivity differing between the processes. Leaf appearance on branches is seen as a major determinant of adaptation of leaf area to soil drying.



Growth form trade-off in *Leymus secalinus*

In clonal plants producing both spreading and clumping ramets, **Ye *et al.* (pp. 187–191)** explore a possible trade-off between guerilla and phalanx growth forms in conditions of contrasting mineral nutrient supply. They show that, with increasing nutrient availability, the proportion of clumping ramets in *L. secalinus* increases whereas that of spreading ramets decreases.

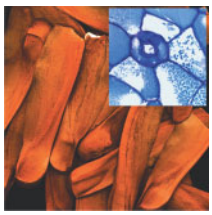
Post-dispersal seed predation by ants and birds in an alpine ecosystem

Muþoz and Cavieres (pp. 193–201) quantify removal of seeds of nine shrubby-, herbaceous- and cushion-plant

species by ants vs. birds in the central Chilean Andes. Seed predation is shown to be an important cause of decreases in potential species recruitment, although the impact differs between the species.

Defence and tolerance to clipping in *Caragana korshinskii*

It is generally assumed that plants respond to natural enemies by either allocating resources to resistance traits or compensating for damage. **Fang *et al.* (pp. 203–211)** show that *Caragana korshinskii* responds to above-ground shoot removal through combining both defence and tolerance strategies.



Stomata in seed coats

Stomata are uncommon in seed coats and their roles are still unclear. **Paiva *et al.* (pp. 213–217)** verify the presence of stomata in *Swietenia macrophylla* seeds and evaluate their role in seed imbibition. The contribution of these stomata to gas exchange and embryo respiration is also discussed.

Adaptation by *Quercus serrata* to the leaf-rolling beetle *Apoderus erythrogaster*

Quercus serrata saplings are attacked by many insect herbivores. **Mizumachi *et al.* (pp. 219–226)** examine how resulting compensative growth is achieved at different nutrient levels. Integral to the approach are concepts of plant modularity and the production of growth flushes in units that act semi-autonomously with regard to resources.

Nutrient heterogeneity promotes size-asymmetric competition

Using populations of *Lolium perenne, Plantago lanceolata* and *Holcus lanatus*, **Maestre and Reynolds (pp. 227–235)** find nutrient heterogeneity promotes size asymmetry that, in turn, can confer a disproportionate competitive advantage. In *Plantago* and *Holcus*, the effect is shown to be more pronounced under high nutrient supply. In *Plantago*, it is more pronounced under elevated atmospheric [CO_2].

Exine micromorphology of orchid subtribe Orchidinae

Barone Lumaga *et al.* (pp. 237–244) test whether variation in exine micromorphology reflects phylogenetic relationships and if it is influenced by differences in pollination ecology. While some clades are shown to be characterized by a common exine surface, differences in surface characteristics do not consistently reflect shifts in pollination strategy.

Phylogeny and classification of *Paris* (Melanthiaceae)

Paris spp. have high medicinal utility in China. However, circumscription of the genus and its subdivision remain unresolved. Phylogenetic analyses by **Ji *et al.* (pp. 245–256)** based on ITS, *psbA-trnH* and *trnL-trnF* DNA sequence data support a broadly defined treatment of the genus, and a new infrageneric classification of two subgenera and five sections.

Photoprotection in young leaves of grapevine

Young leaves of several *Vitis vinifera* cultivars possess anthocyanins or are pubescent. These features may offer photoprotection **(Liakopoulos *et al.*, pp. 257–265)** since, compared to glabrous-green leaves, they display superior photosynthetic parameters and are less dependent on xanthophyll cycle energy dissipation. The net photoprotective potential of these leaves may increase further in stressful environments.

Kaolin applications and tree stress physiology

Kaolin applications are thought to reduce the negative effects of water and heat stress. In almonds and walnut, **Rosati *et al.* (pp. 267–275)** find that kaolin cools leaves but fails to influence tree water status or mitigate adverse effects of the stresses on photosynthesis. Its application effects a minor reduction in photosynthesis due to shading.