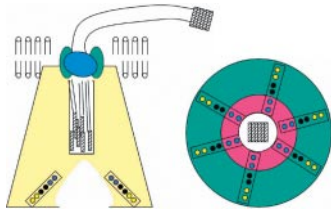


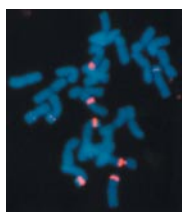
Calcium is not the be-all and end-all (Botanical Briefing)

The cytosolic free Ca^{2+} concentration is thought to perform many tasks in plants. Evidence suggests three classes of function: Ca^{2+} as a protective agent, Ca^{2+} as a chemical switch and Ca^{2+} as a 'digital' information carrier. **Plieth (pp. 1–8)** presents examples of the first two classes. The third is controversial and new observations call the 'Ca²⁺ signature hypothesis' into question.



New views on cellulose biosynthesis (Invited Review)

Cellulose, the most abundant macromolecule, is one of the last frontiers for structure/function discovery. With an enzyme complex as large as a ribosome, the cellulose synthase complex is being redefined, based on new information from molecular and cell biology. **Saxena and Brown (pp. 9–21)** present current views and evolving concepts of this most important natural product and process.



Polyploid evolution in wild barley

Polyploidy is well developed in wild barley species (genus *Hordeum*).

To elucidate ancestry of ten American polyploid species, **Taketa *et al.* (pp. 23–33)** investigate variation in 5S and 18S–25S ribosomal RNA genes, and show that each of the tetraploid and hexaploid species groups includes two different lineages.



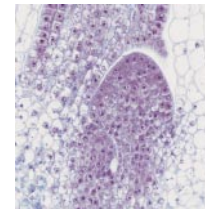
Photoprotective systems and AI in citrus leaves

Chen *et al.* (pp. 35–41) find that antioxidant systems are up-regulated in AI-treated citrus leaves and protect them from photoxidative damage even though thermal energy dissipation is decreased. These findings indicate that antioxidant systems are more important than thermal energy dissipation in relieving excess excitation energy in AI-treated citrus leaves.



Photosynthesis in relation to reproductive success of *Cypripedium flavum*

Reproductive success may be linked to photosynthetic productivity. **Zhang *et al.* (pp. 43–49)** show that higher photosynthetic capacity is beneficial for reproduction of *Cypripedium flavum*, a rare endemic alpine slipper orchid of China. Accordingly, the $A_{\text{daily}}/A_{\text{max}}$ ratio can be a useful proxy for evaluating reproductive success of this orchid.



Endogenous leaf formation in the absence of a shoot apical meristem

Podostemaceae live in rapids and waterfalls and exhibit very unusual morphologies adapted to this extreme habitat. **Imaichi *et al.* (pp. 51–58)** show that the shoot lacks a shoot apical meristem and that leaves form endogenously from older leaves due to cell degeneration and cleavage.



Cotton pollen response to temperature

In vitro pollen germination and pollen tube growth responses to temperature in 12 cotton genotypes are discussed by **Kakani *et al.* (pp. 59–67)**. Membrane thermal stability of the leaves of the selected genotypes is evaluated and related to reproductive processes. Principal component analysis is used to identify parameters indicating greater tolerance.



Wind dispersal of *Artemisia halodendron* seeds in moving sands of Inner Mongolia

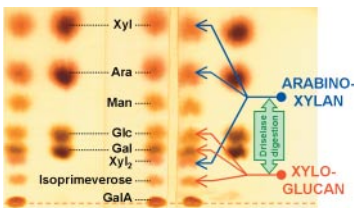
Li *et al.* (pp. 69–80) indicate that although spatial variation in wind speed

and frequency strongly affect spatial seed deposition, the pattern of seed deposition does not determine seedling distribution. Instead, it appears to be determined more by seed persistence in the shifting sand than by seed recruitment from wind dispersal.



Reproductive effort and respiration

More than 50 % of total photosynthate is respired, but little is known about how vegetative and reproductive organs differ in growth and maintenance respiration. **Kinugasa *et al.* (pp. 81–89)** show that maintenance respiration in *Xanthium canadense* is far lower in reproductive than in vegetative organs. Thus, reproductive effort in terms of dry mass amounts to more than simply the allocation of photosynthate.



Xyloglucan–pectin linkages in both monocots and dicots

Hitherto, it has been unclear how widespread xyloglucan–pectin covalent linkages are in the primary cell walls of higher plants. **Popper and Fry (pp. 91–99)** now report their presence in all seven angiosperms (five dicots and two gramineous monocots) that they examined using cell culture. This evolutionary conservation suggests an important role in wall structure and function.



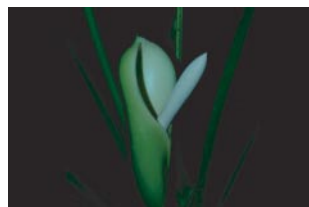
Drought tolerance in coffee

Little is known about how clones of *Coffea canephora* respond physiologically to drought. **Pinheiro *et al.* (pp. 101–108)** show that differences in root depth, hydraulic conductance and stomatal control of water use, but not osmotic or elastic adjustments, explain much of the relative difference in tolerance to drought amongst clones of *C. canephora*.



Desiccation tolerance in lichens

Lichens often grow in harsh, dry habitats. While it is assumed that lichens rely mainly on constitutive desiccation tolerance mechanisms, **Beckett *et al.* (pp. 109–115)** show that hardening treatments significantly improve the recovery of photosynthesis during rehydration. They use the novel approach of measuring heat production to show that desiccation tolerance may not be inducible in the fungal symbiont.



Thermogenic constraints in aroid inflorescences

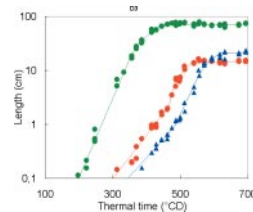
Gibernau *et al.* (pp. 117–125) characterize heat loss kinetics from the

spadix of 19 tropical species of the Aroideae. The increase in temperature difference between the spadix and ambient air is shown to be physically constrained and corresponds to the value of a thermal model of heat conduction in an insulated cylinder with an internal heat source.



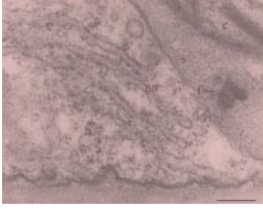
Reproductive allocation for annual *Lesquerella fendleri* and perennial *L. mendocina* compared

Although higher vegetative allocation of dry mass was found for perennial *L. fendleri* compared to annual *L. mendocina*, **Ploschuk *et al.* (pp. 127–135)** find that both brassica species show similar seed allocation patterns with no reduction in the importance of seed hierarchy in the perennial.



Modelling phased extension growth in maize shoots

Organ extension occurs as a succession of phases. **Hillier *et al.* (pp. 137–148)** examine maximum likelihood estimation of the parameters of multiphase models and establish a set of models describing the extension of successive organs along the shoot. They show that changes in duration of extension determine the differences in length of mature laminae in populations grown at two contrasting population densities.



Soybean responses to manganese and iron

Deficient or excessive levels of manganese or iron in soils strongly influence growth of soybean.

Izaguirre-Mayoral and Sinclair (pp. 149–158) compare responses in two genotypes with differing abilities to accumulate Mn or Fe and document differences in leaf concentrations, growth and ultrastructural changes over a wide range of nutrient treatments.



Dormancy and after-ripening in an endemic metallophyte

Most serpentine-endemic metallophytes are rare and threatened. To enhance conservation efforts of the rare serpentinophyte *Stackhousia tryonii*, **Bhatia et al. (pp. 159–163)** examine the effects of dormancy-relieving treatments on germination and demonstrate that the seeds require an after-ripening period.