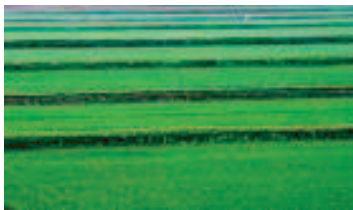




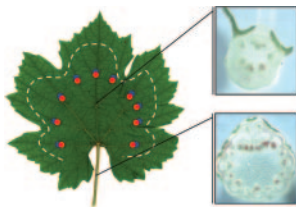
Molecular systematics help predict impact of climate change (Botanical Briefing)

Over 100 plant genera occur disjunctly in North America, East Asia and/or South West Eurasia, reflecting contraction of once circumboreal ranges and offering clues to how climate change will affect modern plant distributions. **Milne (pp. 465–472)** assesses the progress of molecular systematics in elucidating the timing and directions of movement amongst these species.



Improving mineral nutrient efficiency for tomorrow's crops—emerging solutions for China (Invited Review)

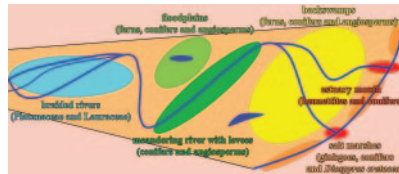
Innovative solutions for improving plant nutrient efficiency are urgently needed in the face of the expanding human population. **Yan et al. (pp. 473–482)** highlight several case studies to illustrate progress to date and to propose possibilities for further gains by means of genetic and molecular methodologies and a co-ordinated nationwide approach.



Xylem connectivity in grapevine and passive bacterial spread

Xylella fastidiosa is a xylem-mobile bacterium causing leaf scorch. **Chatelet et al. (pp. 483–494)** identify an unimpeded xylem transport pathway that may help distribute the pathogen from

stem to leaf. Connections do not extend to leaf margins where scorching occurs, suggesting either a final signal-targeting step to specific cells or a toxic build-up at hydathodes.



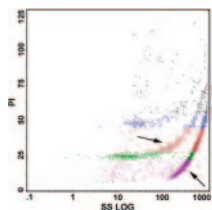
Mid-Cretaceous plant ecology of Europe

Early Cretaceous angiosperms competed successfully in previous gymnosperm-dominated environments. **Coiffard et al. (pp. 495–502)** show that during the Mid-Cretaceous (i) angiosperms were already highly diversified and dominated ferns and conifers in the floodplains, (ii) ginkgoes, conifers and the first European brackish water-related angiosperms lived in salt marshes and (iii) bennettites and conifers grew in river estuaries.



Nectar, floral morphology and pollination in the Loasaceae

Nectar production is investigated by **Ackermann and Weigend (pp. 503–514)** in 31 Loasaceae species from different habitats in South America. Four nectar groups were distinguished and the phylogeny shows that switches from bee- to hummingbird-pollination have taken place several times in the past.



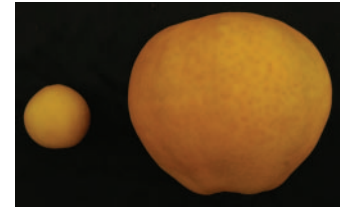
Tannic acid effect on plant nuclei **Loureiro et al. (pp. 515–527)** describe how tannic acid interferes with estimations of nuclear DNA content in

flow cytometry. Tannic acid is shown to change light scattering properties of cell nuclei and to interfere with nuclei staining by propidium iodide. Recommendations for minimizing the negative effect of such cytosolic compounds are provided.



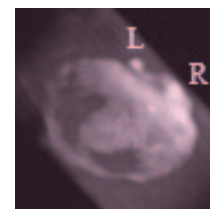
Characterizing the phenomenon of infrequent flowering in bamboo

Bhattacharya et al. (pp. 529–535) describe inflorescence characteristics, floral features and 32 key morphological descriptors in 17 populations of *Bambusa tulda*, confirming their fidelity using RAPD profiles from genomic DNA. Prezygotic isolating mechanisms appear to prevent seed set after sporadic flowering.



Evolution of fruit size in *Pyrus pyrifolia*

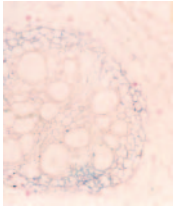
Contributions by cell division and cell enlargement to the evolution of fruit size in *Pyrus pyrifolia* are evaluated by **Zhang et al. (pp. 537–543)**. The evolution of fruit size is found to have resulted mainly from shifts in the extent of cell division rather than of cell enlargement.



Tracing water uptake into leguminous seeds during early imbibition

Fast time-lapse magnetic resonance imaging by **Kikuchi et al. (pp. 545–553)**

visualizes the pathway of water entry into leguminous seeds. Water is shown to enter seeds only through the lens and to reach the radicle within the testa prior to cotyledon swelling.



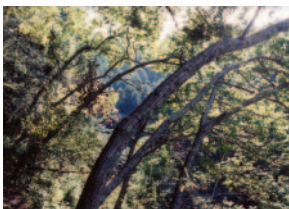
Pathogenesis-related gene expression in tomato grown on suppressive compost

Suppressive compost can trigger indirect defence mechanisms and enhance pathogen resistance reminiscent of systemic acquired resistance. The compost increases expression of certain *PR* genes in roots of tomato in the absence of pathogens. Expression patterns of these genes are helping **Kavroulakis et al. (pp. 555–564)** elucidate the defence roles of these *PR* genes.



Glycinebetaine accumulation in transformed rice

Rice is incapable of accumulating stress-adapting glycinebetaine (GB) because it lacks a functional choline mono-oxygenase (CMO) gene. **Shirasawa et al. (pp. 565–571)** find that transformants over-expressing spinach CMO fail to accumulate GB. Alternative strategies for this technology are discussed.



Phototropism in tree stems

Some trees incline their stems downwards on forest slopes under horizontally asymmetric light environments. **Matsuzaki et al. (pp. 573–581)** reveal that the orientation of non-elongating woody stems in four species can be

actively controlled by phototropism. A significant interspecific correlation between phototropic responsiveness and stem inclination on forest slopes is identified.



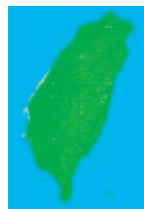
Genetic diversity and differentiation in *Nouelia insignis*

Nouelia insignis is a narrowly distributed species of the Jinsha and Nanpan drainage areas of southwestern China. Using ISSR fingerprinting, **Luan et al. (pp. 583–589)** detect unexpectedly small amounts of genetic differentiation between the two drainage areas despite separation by long distance and geographical barriers. Historical migration is the proposed explanation.



Seed bank expression, adult longevity and aridity in species of Central Chile

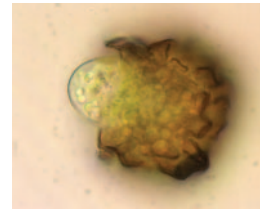
Using 32 populations of annual and perennial species of *Chaetanthera* (Asteraceae), **Arroyo et al. (pp. 591–600)** investigate relationships between perennial/annual lifestyles and seed size or duration and size of seed storage capacity in the soil. The results indicate that annual lifestyle, aridity and small seed size favour large seed banks.



Allozyme variation and diversion centres of *Castanopsis carlesii*

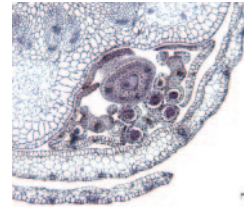
Cheng et al. (pp. 601–608) use allozymes to determine evolutionary history for *Castanopsis carlesii* in Taiwan based on a study of 22 populations. Principal

centres of diversity and the genetically most-divergent sites are identified. The findings illustrate how unordered markers such as allozymes can be used to infer past population histories in place of chloroplast DNA.



Spore fitness in polyploid vs. diploid buckler-ferns

Quintanilla and Escudero (pp. 609–618) examine spore traits with potentially adaptive consequences in diploid and allotetraploid species of *Dryopteris*. Allotetraploids have bigger spores and show faster germination rates, whereas relative fitness at both sporogenesis and germination is similar between allotetraploids and diploids.



Lateral floral scales in *Hellmuthia* are cyperoid perianth parts

Vrijdaghs et al. (pp. 619–630) propose that *Hellmuthia* should be transferred from Mapanioideae, Chrysitricheae to Cyperoideae, Cyperaceae because the developmental patterns of floral scales in *Hellmuthia* and cyperoid perianths are similar. Furthermore, a third, adaxial scale occurs in some flowers in *Hellmuthia* while lateral floral scales in *Hellmuthia* are not homologous to those of *Parampania*.



Arsenate and phosphate uptake systems in wheat

Using two cultivars of *Triticum aestivum* and associated doubled haploid lines, **Zhu et al. (pp. 631–636)** find that 25 μm

is the likely concentration at which the high-affinity uptake system commences or dominates over low-affinity uptake. Some promising lines discriminate strongly against arsenate when grown in hydroponics.



Integrated analysis of tropical tree growth

Multivariate analysis by **Yáñez-Espinoza *et al.* (pp. 637–645)** integrates anatomical, physiological and environmental factors affecting growth processes in three tropical tree species. A strong influence of climate on phenology and radial growth of tropical trees is revealed, but differences in environmental responses between species help explain their successful co-existence.



Molecular characterization of cocoa (*Theobroma cacao*) from the Peruvian Amazon

The Peruvian Amazon harbours diverse cocoa populations. Using micro-satellite DNA markers, **Zhang *et al.* (pp. 647–655)** assess genetic identity and population structure of cocoa germplasm from the Huallaga and Ucayali valleys, Peru. The results highlight the need for

additional collecting and conservation measures for cocoa germplasm in the Peruvian Amazon.



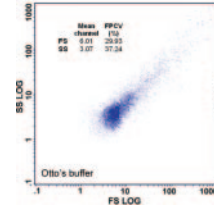
Physiological integration of dwarf bamboo

Dwarf bamboos form expansive rhizome systems and can dominate under heterogeneous resource conditions. In glasshouse experiments, **Saitoh *et al.* (pp. 657–663)** trace movement of ^{15}N between interconnected pairs of ramets to demonstrate that, in *Sasa palmate*, extensive physiological integration takes place, particularly when the availability of nitrogen and light is heterogeneous.



Variation in DNA content in *Festuca pallens* on different geographical scales

Šmarda and Bureš (pp. 665–678) show high variability of intraspecific genome size in *F. pallens* at intrapopulation and landscape scales within the entire natural range of both diploids and tetraploids. Geographic relationships between genome sizes, prevalence of plants with larger genomes in refugial areas and relict habitats suggest the genome size variation is of evolutionary significance.



Comparison of lysis buffers in plant DNA flow cytometry (Technical Article)

Loureiro *et al.* (pp. 679–689) compare lysis buffers used to prepare nuclear suspensions for DNA flow cytometry. No one buffer is shown to be suitable for all species when tests were made of contrasting genome sizes and leaf tissue types. These results will help select the most appropriate buffer.