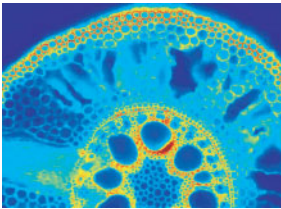


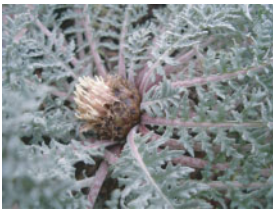
## Cytoskeleton and morphogenesis in brown algae (Invited Review)

**Katsaros *et al.* (pp. 679–693)** evaluate the role of the cytoskeleton in brown algal morphogenesis. Both cytoskeletal elements (microtubules and actin filaments) are implicated in morphogenesis through their involvement in cell wall development, polarization, spindle organization and the cytokinetic mechanism.



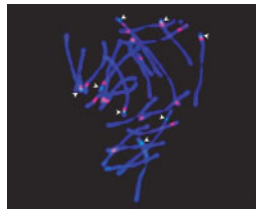
## Aerenchyma formation is promoted by sulfur deficiency

**Bouranis *et al.* (pp. 695–704)** show that aerenchyma in the *Zea mays* root cortex is enhanced by sulfate deprivation. The gas-filled spaces are created by localized cell death linked to reactive oxygen species, changes in  $\text{Ca}^{2+}$ , pH and lignification, and are associated closely with a proliferation of lateral roots.



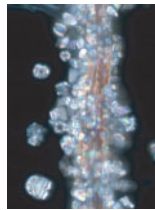
## Phylogeny of *Rhaponticum* and related genera: taxonomic and biogeographic implications

A new hypothesis for the phylogeny of the *Rhaponticum* group is formulated by **Hidalgo *et al.* (pp. 705–714)** based on molecular markers ETS, ITS and *trnL-trnF*. The results imply a redefinition of the generic limits of the group and suggest coherent biogeographical routes of migration and speciation processes for the genus.



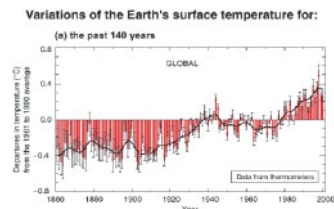
## rDNA loci distribution in pine genome

**Cai *et al.* (pp. 715–722)** find more rDNA loci in subgenus *Strobus* than in subgenus *Pinus*. Correlations between rDNA FISH patterns and phylogenetic relationships among *Strobus* species suggest that chromosomal rearrangements played a role in the splitting of the two subgenera. Transpositional events are considered responsible for the variable rDNA distribution.



## Leaf crystal macropatterns

Only two previous studies have described crystal macropatterns from leaf inception to abscission. **Lersten and Horner (pp. 723–729)** show that *Prunus serotina* diverges remarkably from closely related *P. virginiana* in development, in mature crystal arrangement and the types of crystals. Crystal macropattern studies are thus beginning to fill a gap in the understanding of plant crystals.



## Global warming strongly impairs tomato male reproductive development

**Sato *et al.* (pp. 731–738)** show that in *Lycopersicon esculentum*, moderately elevated temperature stress (32 °C day/26 °C night) disrupts sugar metabolism in the androethium before anthesis and inhibits proline transport into microspores. This depresses pollen

release and viability, thereby drastically reducing fruit set.



## Rubisco activase localization in chloroplasts

Rubisco activase appears to have multiple functions depending on its distribution within the chloroplast. **Jin *et al.* (pp. 739–744)** show Rubisco activase in rice leaves is localized in the stroma and thylakoid membrane of chloroplasts with the proportion changing when the overall content is reduced by antisense transformation.



## Cost of reproduction in epiphytic bromeliads

Previous demographic studies indicate a substantial cost of reproduction in terms of a reduction in subsequent survival, growth and fruit set in epiphytes such as *Werauhia sanguinolenta*. **Zotz and Richter (pp. 745–754)** examine its physiological basis.



## Dehydrin and LEA sequencing and gene expression in coffee

DNA sequencing of dehydrins and a late embryogenesis abundant protein (LEA) by **Hinniger *et al.* (pp. 755–765)** permit a comprehensive analysis of expression in developing grain, leaves and flowers. The LEA protein is linked closely to endosperm development and identification of promoter sequences

of a dehydrin holds promise for studies of regulation.



### Sugar composition and nectar production in the Gentianales

In a study of 47 species of the Gentianales from an Ecuadorian montane forest, **Wolff (pp. 767–777)** asks if nectar features are related to the type of pollinator, or whether they are relatively constant conservative features within taxonomically related species.



### Wounding induces resistance to rust in bean

Insect damage activates defences that prevent further insect damage. It can also increase resistance to pathogen infection. **Walters et al. (pp. 779–784)** show that wounding first leaves of bean initiates resistance to rust infection and accumulation of oxylipins in both first and second leaves. Possible role(s) of these oxylipins in wounded plants are discussed.



### Desiccation increases orthodox seed longevity

A 15-year study by **Ellis and Hong (pp. 785–791)** of clover and alfalfa seed in hermetic storage shows the ‘low-moisture-content limit’ to negative logarithmic relationships between seed longevity and moisture content varies slightly with temperature. At all temperatures tested, a further 2 % reduction in moisture content is found to have little effect.



### Implications of hybridization zones

Hybridization zones are believed to be dynamic centres of ecological and evolutionary processes. **Van Droogenbroeck et al. (pp. 793–805)** examine highland papayas (*Vasconcellea*) from a natural hybrid zone in southern Ecuador using molecular markers. The results confirm occasional contemporary hybridizations between several taxa and demonstrate the complex patterns of genetic diversity in natural hybrid zones.



### Genetic differentiation in the Cycas balansae complex

Species delineation in the *Cycas balansae* complex is controversial. **Xiao and Gong (pp. 807–812)** assess its genetic diversity and differentiation, and reveal the *C. balansae* complex to be highly divergent genetically and to have evolved into five genetically distinct units, each of which corresponds closely to the morphologically defined species.



### Herbivores prefer productive species to less productive species

A ‘cost–benefit hypothesis’ suggests that photosynthetically productive leaves are more susceptible to herbivore attack than less productive leaves. **Matsuki and Koike (pp. 813–817)** demonstrate that species with shorter leaf life spans have greater photosynthetic productivity and

are more susceptible to herbivore attack than species with longer life spans.



### Variation in baobab is related to climatic zones

**Assogbadjo et al. (pp. 819–830)** investigate the level of genetic and morphometric variation within and between baobab (*Adansonia digitata*) populations from three climatic zones of Benin, where this species is considered to be threatened. Based on the results, they draw consequences for the management and conservation of the species.



### Stomatal oscillations are normal in orange trees (Short Communication)

Stomatal oscillations reported in many species have usually been induced by environmental step change. **Steppe et al. (pp. 831–835)** show that, in young pot-grown orange trees and in mature soil-grown orchard trees, pronounced stomatal oscillations occur and persist under natural climatic conditions. Underlying principles behind the oscillations are discussed.



### Root and micro-organism growth and rhizosphere development (Review)

**Watt et al. (pp. 839–855)** review roots and rhizospheres in terms of distances, characteristic times for solute diffusion,

and rates of root and organism growth. They highlight the kinematics of growth zones and interacting organisms, the short distances over which solutes are exchanged quickly, and the rudimentary state of our knowledge of root–organism interactions in the field.



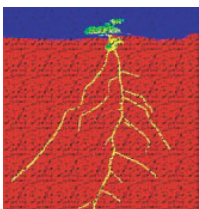
### Slope profoundly affects plant stability and physiology

Scippa *et al.* (pp. 857–866) use *Spartium junceum* to investigate mechanisms involved in root anchorage on slopes. They report morphological, biomechanical and molecular changes in slope-grown plants that may constitute significant parts of the anchorage mechanism.



### How does exogenous N stimulate root extension?

Root extension in maize is promoted by external  $\text{NO}_3^-$  and  $\text{NH}_4^+$  even when plants have ample N-reserves (Bloom *et al.*, pp. 867–873). The effect is neither the outcome of cell wall pH change nor of increased elasticity, but may be a consequence of  $\text{NO}_3^-$  and  $\text{NH}_4^+$  acting as osmolytes.

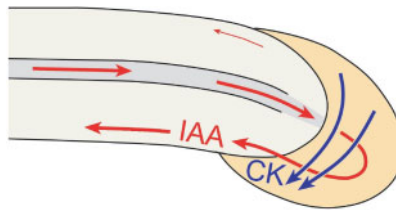


### Nitrogen and root branching (Review)

The ability of roots to forage for heterogeneously distributed nutrients requires individual root tips to monitor variations in external nutrient

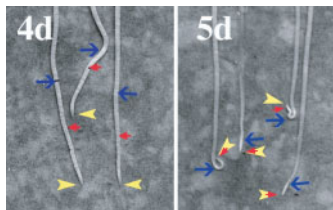
concentrations continuously.

Walch-Liu *et al.* (pp. 875–881) discuss recent advances in our understanding of how root growth and development can respond to signals from both organic and inorganic forms of nitrogen.



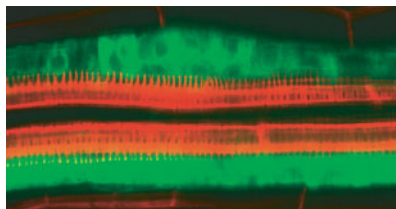
### Hormonal regulation of root development and architecture

Aloni *et al.* (pp. 883–893) review and analyse the regulation of primary vascular differentiation, lateral initiation, apical dominance and gravitropism by cytokinins, auxin and ethylene. They propose novel control mechanisms for the radial patterning of root vascular differentiation and for the initiation of laterals.



### Programmed cell death in flooded root tips

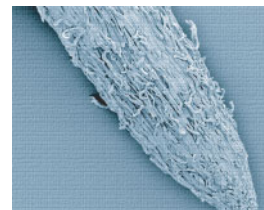
Although primary roots of 5-day-old pea plants (*Pisum sativum*) rapidly form vascular aerenchyma when flooded, Gladish *et al.* (pp. 895–902) find it is not sufficiently extensive to prevent apical death. However, this programmed cell death of apical cells may divert resources to support lateral roots in better-aerated parts of the main root axis.



### Lateral roots in arabidopsis are initiated only during a narrow developmental window

Using enhancer trap line J0121 and time-lapse, Dubrovsky *et al.*

(pp. 903–915) show a narrow time window for initiation but with no specific cell-count or distance-measuring mechanisms operating. However, root density analyses can predict the average distance between adjacent lateral initiation sites.



### Release of living root cap border cells is linked to meristem type

Hamamoto *et al.* (pp. 917–923) reveal that root caps of species exhibiting ‘open’ apical meristems produce more border cells than those of species with ‘closed’ apical meristems. Roots with closed meristems release mainly dead cap cells, whereas roots with open meristems release free-living border cells. The ecological significance of this is discussed.