

Modelling plant responses to elevated CO₂ (Botanical Briefing)

Despite recent progress in modelling effects of elevated [CO₂] on leaf photosynthesis, simulation of [CO₂] effects on plant growth remains difficult. **Ewert (pp. 619–627)** shows that variability of plant growth and productivity under elevated CO₂ largely depends on leaf area index (LAI), and stresses the need for improved modelling of LAI.



Ecophysiology and Crassulacean Acid Metabolism (CAM) (Invited Review)

Lüttge (pp. 629–652) discusses how Crassulacean Acid Metabolism (CAM) plants are subject to input via a network of environmental parameters. Receivers of the environmental cues are the phenotypes generated by CAM genotypes, where phenotypic morphotypes and physiotypes produce output at the community level shaping habitats and ecosystems, and where physiological synecology reveals that phenotypic plasticity constitutes the ecophysiological advantage of CAM.



Ecotypic differences in vernalization response for a winter annual grass

Winter annuals time their flowering by means of their vernalization requirement.

Meyer *et al.* (653–663) show that populations in the introduced western North American range of *Bromus tectorum* possess adaptively significant genetic variation in vernalization response. A warm desert population is shown to require only minimal vernalization, while foothill and montane populations require much longer periods. This ecotypic differentiation took place within approximately the last 100 years.



Temperature, CO₂ and respiration

At night, respiration provides the energy and reductant needed to support translocation of carbohydrates from leaves and for the reduction of nitrate. **Bunce (pp. 665–669)** reports that both translocation and nitrate reduction respond to changes in respiration brought about by altering temperature or carbon dioxide concentration.



Links between seasonal patterns of growth and the supply and deposition of mineral nutrients

The coupling of seasonality of growth and the patterns of nutrient depletion and accumulation in nutrient storage sites such as old leaves is examined by **Milla *et al.* (pp. 671–680)**. To accomplish this, branch-level NPK dynamics are compared in two mediterranean woody species that differ in their seasonal arrangement of vegetative and reproductive phenologies.



Modelling early weed growth

Seedling growth rates of a range common weed species are modelled by **Storkey (pp. 681–689)** as a function of temperature and radiation. In the past, a lack of such information has hindered the application of simple models of crop/weed competition to reducing herbicide inputs. The implications of seedling growth rate to wider plant strategies are discussed.



Founder effects of trees at the margins of their range

Muir *et al.* (pp. 691–697) examined the possibility of founder effects at the edges of a species' natural range using microsatellite and plastid variation among *Quercus petraea* remnants sampled along a north–south axis in Ireland. Despite the distance from the glacial refugium, nuclear genetic variation was comparable with mainland Europe. Plastid DNA indicated the modest differentiation expected from the lower effective population size.



Effect of 3D nitrogen, dry mass per area and local irradiance on canopy photosynthesis within maize leaves

Row-maize crops are characterized by strong horizontal heterogeneity of foliage distribution. By using three-dimensional

(3D) representations of plants, **Drouet and Bonhomme (pp. 699–710)** assess, through simulations, the combined effect of spatial distribution of nitrogen and light on crop photosynthesis. They highlight the role of dry mass per unit lamina area in determining nitrogen content per unit lamina area.



Reproductive ecology of endangered alpine species

Eryngium alpinum is in decline. **Gaudeul and Till-Bottraud (pp. 711–721)** examine features of the breeding system that contribute to this. They show pollination is by generalist insects and that seed set is limited by low pollen productivity. Typically short flights of a major pollinator and poor seed dispersal may result in high genetic variability across natural populations and susceptibility to habitat fragmentation.



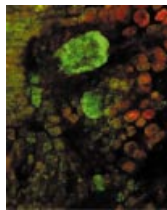
Critical stages in the recruitment of *Rhamnus alaternus*

The importance of different recruitment stages in the overall regeneration process of *Rhamnus alaternus* is assessed by **Gulías et al. (723–731)**. They show that post-dispersal seed predation and summer drought limits seed and seedling survival, which are identified as bottleneck processes in the recruitment of this species.



Sex change in dying *Acer* trees

Sex changes of plants may occur because of associations between sex expression and plant health. **Nanami et al. (pp. 733–740)** report that in a natural population of *Acer rufinerve*, increasing femaleness occurs after an environmental stress induced by lack of rain. *Acer rufinerve* is also shown to reproduce as the female prior to death.



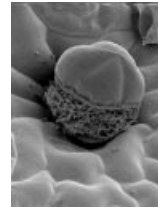
Calcium channels and plant crystals

Calcium oxalate crystals form in specialized cells (crystal idioblasts) in many plants and can play a role in tissue calcium regulation. **Volk et al. (pp. 741–753)** use calcium channel blockers and probes to demonstrate that crystal idioblasts are enriched in channels and that channel activity is required for accumulation of calcium used in crystal formation.



Sexual mimicry in the orchid *Mormolyca ringens*

A significant number of orchid species offer no flower reward to their pollinators. In this study, **Singer et al. (pp. 755–762)** report and illustrate pollinator attraction through sexual mimicry in *Mormolyca ringens*. This is the second species of Maxillarinae orchids now known with this characteristic. Details of labellum micromorphology and flower volatiles are provided that further enhance understanding of the features involved in pollinator attraction.



Neoclerodane diterpenes in trichomes of a *salvia*

Salvia divinorum produces several closely related neoclerodane diterpenes. The most abundant of these, salvinorin A, possesses psychoactive properties. **Siebert (pp. 763–771)** shows the diterpenes to be localized in peltate glandular trichomes that are highly varied in their morphology and distribution.



Unspecialized pollination of New Zealand epiphytic orchids

Lehnebach and Robertson (pp. 773–781) show that, in contrast to many epiphytic orchids in the tropics, the orchid–pollinator relationship in four epiphytic orchids of temperate New Zealand is unspecialized, with numerous dipterans identified as putative pollinators. All four orchids display floral adaptations to a myophilous pollination syndrome.