

ContentSelect

John Bryant takes a closer look at some of this month's Original Articles



Strictly for the birds or going batty in Brazil?

I am sure that all or nearly all of our readers acknowledge that evolution is an ongoing active process. However, for more complex multicellular organisms it usually happens too slowly for us to see, although there are occasional exceptions to this. It is therefore very satisfying to find an example of an evolutionary change being proposed by **SanMartin-Gajardo and Sazima, São Paulo, Brazil (pp. 1097–1103)**. They have studied pollination biology in two genera, *Sinningia* and *Paliavana*, in the neotropical tribe Sinningieae. Two of the studied species, *S. brasiliensis* and *P. prasinata*, are

morphologically typical bat-pollinated flowers. They are also strongly scented, produce copious nectar and open at sunset. Flowers in both species last for just two or three nights. Direct observation reveals that the flowers are visited during the night by bats and that the bats do indeed transfer pollen, confirming what is deduced from floral characters. There are occasional visits during daylight by hummingbirds but these do not result in pollen transfer. However, the situation in *S. sericiflora* is much less clear-cut. Some of its floral characters are again typical of bat-pollinated flowers but other characters, including the long tubular corolla and the colour of the calyx, are more typical of hummingbird-pollinated flowers. Flower opening occurs randomly through the day and night—there is certainly no synchronous dusk opening—and the very lightly scented flowers last for several days, during which there is again copious nectar production. Observations in the field show that the only visitors are hummingbirds and that the visits, which occur only in daylight, result in pollen transfer. These data support the authors' suggestion that *P. sericiflora* is an evolutionary intermediate. In which direction the evolution is going is difficult to determine, but further field studies on related species combined with molecular phylogenetic investigations should help to solve this.

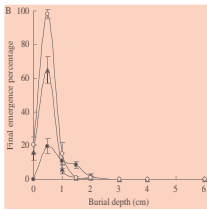


Houses and hotels have monopoly on *Helianthemum* habitats

As noted before in these pages, significant numbers of plant species are becoming increasingly rare or threatened by extinction. It is often difficult to know exactly how to ensure survival of such species, but it seems obvious that a working knowledge of their ecology and breeding biology is essential. Thus, **Javier Rodríguez-Pérez (pp. 1229–1236)**, based in Mallorca, one of the Spanish Balearic Islands, has studied two *Helianthemum* (rock-rose) species that occur on the islands as well as on the mainland of Spain. He performed hand-pollination experiments to determine inbreeding and

outbreeding success, and also studied abundance of pollinators in the wild along with investigations of floral traits, flowering times and the effects of weather. *Helianthemum mariflorum* is mainly an outbreeder: fruit and seed set in self-pollinated flowers is only about one-third of that in out-pollinated flowers. *Helianthemum caput-felis*, however, shows no difference between self- and out-pollinated flowers. Natural pollination was mostly by hymenopterans and, in *H. mariflorum*, especially *Apis mellifera*, the honey bee. *Helianthemum mariflorum*, as a mainly outbreeding species, is more vulnerable to variations in pollinator populations, a feature that is clearly seen in comparisons between 2001 and 2002. The weather in 2002 was very wet and pollinator abundance was much lower. *Helianthemum mariflorum* showed a 50 % decrease in fruit set between these 2 years. However, this was somewhat compensated for by a much increased seedling survival in 2002. Taking all these factors into account, the author concludes that even allowing for the vagaries of the weather, it is not reproductive success that limits these two species. Instead he attributes their increasing rarity to loss of habitat through urbanization, a feature only too familiar to those of us who have visited Spain and its islands. This emphasizes the importance of setting aside refuges large enough to support viable populations, a policy which fortunately is already being implemented.

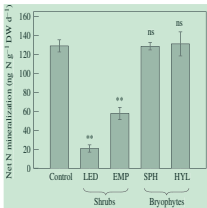
Continued overleaf



Probing the depths

The sowing instructions on seed packets that I buy from my local garden centre are very clear about the depths at which seeds of particular species should be sown. But does it really make any difference? In the wild, seeds have no human agency to regulate the depth at which they are buried, if indeed they are buried. However, depth of burial has been shown to affect germination in a number of species and this has been confirmed by the work of **Zheng *et al.* (pp. 1237–1245)**. Their motivation was the need to rehabilitate areas of China affected by desertification. To do this it

has been customary to scatter seeds from the air, but the success rate is very low. Suspecting that this seeding method did not expose the seeds to ideal germination conditions, the authors have investigated the effects of depth of burial in sand and of water supply on the germination of seeds of six species typically used in re-seeding operations. The results are very clear. Firstly, seeds that remain on the surface germinate very poorly, whatever the watering regime. In different species this failure may be ascribed to desiccation or to the inhibitory effects of light. Secondly, nearly all species are affected by the amount of water they receive, with more copious water supply generally leading to greater germination success. Thirdly, depth does matter but how much it matters varies between species. At one end of the scale are species such as *Artemisia sphaerocephala*, which show a very ‘tight’ optimum depth of 5 mm; at the other end is *Medicago sativa*, in which germination success is similar at all depths from 5 to 40 mm but then declines sharply so that there is no germination at 60 mm. Other methods clearly need to be developed for re-seeding the desert (and perhaps I should pay more attention to instructions on seed packets!).



Are spruce seedlings starved of soil-based sustenance?

What factors might hinder the regeneration of an apparently dominant species within a plant community? It is this question that **Castells *et al.*, Barcelona, Spain and Fairbanks, Alaska (pp. 1247–1252)** have attempted to answer. Their research centred on *Picea glauca* (white spruce), which regenerates very poorly, if at all, in managed forests in North America. It has been suggested previously that compounds leaching from plants of the understorey are directly harmful to seeds or seedlings of *P. glauca*, i.e. that failure to regenerate is a result of allelopathy. The authors prepared leachates with high concentrations of phenolics from two understorey shrubs, *Ledum palustre* and

Empetrum hermaphroditum, and leachates with very low phenolic contents from two mosses, *Sphagnum* sp. and *Hylocomium splendens* (although the *Sphagnum* extract was expected to be high in phenolics because the moss itself is). Direct application of the moss leachates to seeds had no effect on germination whilst leachates from the shrubs delayed germination by up to a day and reduced percentage germination from approx. 70 % to approx. 60 %; there was no direct effect of leachates on the growth of seedlings. These data do not support the idea that regeneration failure may be ascribed to an allelopathic effect on germination. Instead it is probable that the interaction between the leachates and soil nitrogen is a major factor. Addition of leachates of *L. palustre* and *E. hermaphroditum* to soil resulted in a significant decrease in mineralization of nitrogen. The reason for this effect on the nitrogen cycle is not clear—it may possibly be attributed to increased microbial growth (and hence sequestering of N in an organic form)—but what is clear is that N availability is reduced and this is likely to affect seedling growth after endogenous N reserves have been exhausted. Whether this alone can explain the poor regeneration is a matter for further investigation.

Professor J. A. Bryant
University of Exeter, UK
E-mail j.a.bryant@exeter.ac.uk