American Journal of Botany
January 2023 • Volume 110 • Number 1

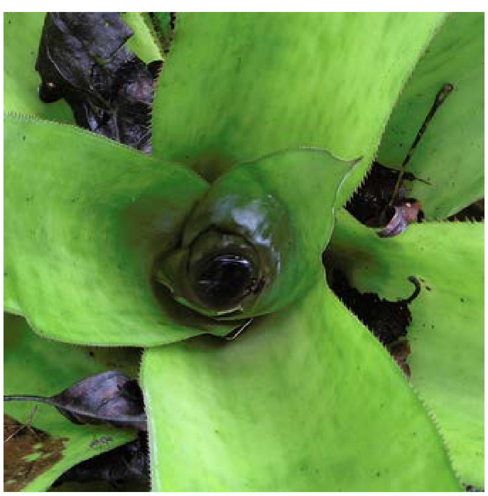
Highlighted Articles for January 2023

Solving the flower paradox of the caper bush

One of the many mysteries surrounding the flowers of *Capparis spinosa* (caper bush) is that although they are nocturnal, they are mainly visited by large diurnal bees, while nocturnal hawkmoths are scarce. **To better understand the pollination biology of caper bush, Kantsa et al. investigated the potential pollinators' perception of caper bush flower scent and color.** The authors analyzed the visual and olfactory cues emitted by the different floral parts in relation to the known sensory biases of the nocturnal (hawkmoths) and diurnal (bees, butterflies) visitors. Although flower visitation by pollinating carpenter bees was 8-fold greater than visitation by hawkmoths, caper appears to have indeed tightly co-evolved with nocturnal hawkmoths. **The authors suggest that the paradox of flowers that show a mixed pollination system (hawkmoths/ bees) but are strongly biased towards the inconsistent pollinator is sustained because of sufficient overlap in the timing of bee activity and flower opening**, and to specific eco-physiological features that allow plants to sustain the production of amino-acid rich volatiles and large quantities of nectar that attract occasional but highly effective visits by hawkmoths. *(Image credit: A. Kantsa)*

Aphrodite Kantsa et al. 2023. Intrafloral patterns of color and scent in *Capparis spinosa* L. and the ghosts of its selection past. *American Journal of Botany*. https://doi.org/10.1002/ajb2.16098

Bromeliads fill their tanks—with protons!



Gretchen B. North et al. 2023. Acid waters in tank bromeliads: Causes and potential consequences. *American Journal of Botany* https://doi.org/10.1002/ajb2.16104

Tank bromeliads capture and store water in the “tanks” formed by their leaf bases, providing resources not only for themselves but for the microbes, invertebrates, and vertebrates they host throughout Neotropical forests. **Because mineral nutrients and water are in limited supply for tropical epiphytes, North et al. investigated the occurrence of low pH in the tank water of bromeliads with respect to its consequences for resource acquisition.** Of eight species examined, six had tank contents that were more acidic than local rain water, with lower pH in high light than in shade. Further work with one widespread species showed that the bromeliad itself lowered the pH by pumping protons from the leaves to the tanks, similar to the way that trap leaves of pitcher plants and roots of several species in nutrient-poor soils lower the pH to improve nutrient acquisition. Because pH had minimal effect on rates of leaf water uptake, **the authors suggest that the primary advantage of tank acidification is increased availability of mineral nutrients, perhaps in concert with effects on the tank microbial community**.

Nodal chokepoints: Rhizomatous plants move water asymmetrically

The archetypal plant is one that produces leaves and stems above ground and roots below ground. However, not all plants conform to this growth type. Many are rhizomatous, meaning they creep along the forest floor, producing both leaves and roots along their stems. These two ways of growing represent the starkest dichotomy in growth forms across plants. While data abound on the hydraulics of upright plants, very little is known about how rhizomatous plants move water through their bodies. **Suissa et al. reconstruct three-dimensional vascular anatomy and explore whole-plant physiology to understand the hydraulics and functional implications of rhizomatous growth.** They observe that water does not move freely across the rhizome but rather is impeded by areas of high resistance at nodes (areas where leaves develop). **This observation suggests that nodes are chokepoints in axial water movement along the rhizome.** These nodal chokepoints decrease the hydraulic interconnectedness of a rhizome but may protect the whole individual from the spread of damage or disease—suggesting a potential tradeoff in the principal construction of the fern rhizome.

Jacob S. Suissa et al. 2022. A bump in the node: The hydraulic implications of rhizomatous growth. *American Journal of Botany* https://doi.org/10.1002/ajb2.16105

The use of alternative clock models provides no support for a recent (Cenozoic) origin of modern quillworts

Niklas Wikström et al. 2023. No phylogenomic support for a Cenozoic origin of the "living fossil" *Isoetes*. *American Journal of Botany* https://doi.org/10.1002/ajb2.16108

Are quillworts (genus *Isoetes*) "living fossils"? The fossil evidence suggests the possibility of an ancient early Mesozoic origin, however recent molecular clock-based analyses suggest a much more recent Cenozoic origin for modern quillworts. **This origin question is addressed by Wikström et al. using molecular clock-based analyses of genomic data from the plastid genome and the nuclear ribosomal cistron.** They evaluate how alternative clock models affect the resulting age estimates. Topological results were consistently resolved across all their analyses. However, with respect to the age of Isoetes, their analyses showed seemingly well-founded, yet strongly deviating outcomes depending on data type and clock model used. Resulting median-age estimates of crown group *Isoetes* ranged from 282 million years (plastid data and the autocorrelated TK02 clock model) to 54 million years (plastid data, uncorrelated ILN clock model). **Thus, while the choice of data and clock model strongly influence node age estimates, there is clearly no consistent support for a recent Cenozoic origin of the living group of *Isoetes* from molecular clock-based analyses.**