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Highlighted Articles for March 2023

Climate change could alter the timing of budbreak in temperate tree species

Plants must cover their energetic demands through photosynthesis, however future climatic scenarios predict photosynthesis to be curtailed by an increase in stressful conditions such as drought, herbivory, and warming. This may cause a negative carbon balance in plants that could particularly affect the spring growth reactivation of plants in temperate regions when carbon demands are high. **To investigate the effects of a negative carbon balance on budbreak timing, Piper and Fajardo shaded a group of tree saplings and compared their budbreak timing to an un-shaded group.** They found that in shade-intolerant species, budbreak occurred earlier and faster in un-shaded plants, while in shade-tolerant species budbreak occurred earlier and faster in shaded plants. **This study highlights the role of carbon metabolism and nonstructural carbohydrates in driving budbreak dynamics and suggests that under future climatic scenarios the budbreak timing will be altered, with the direction of these alterations depending on the light requirements of the species.**

Frida I. Piper and Alex Fajardo. 2023. Carbon stress causes earlier budbreak in shade-tolerant species and delays it in shade-intolerant species. *American Journal of Botany* https://doi.org/10.1002/ajb2.16129

Digging into the fossil record of passionflowers at the early Pliocene Gray Fossil Site (Tennessee, USA)

Elizabeth J. Hermsen. 2023. Pliocene seeds of *Passiflora* subgenus *Decaloba* (Gray Fossil Site, Tennessee) and the impact of the fossil record on understanding the diversification and biogeography of Passiflora. *American Journal of Botany* https://doi.org/10.1002/ajb2.16137

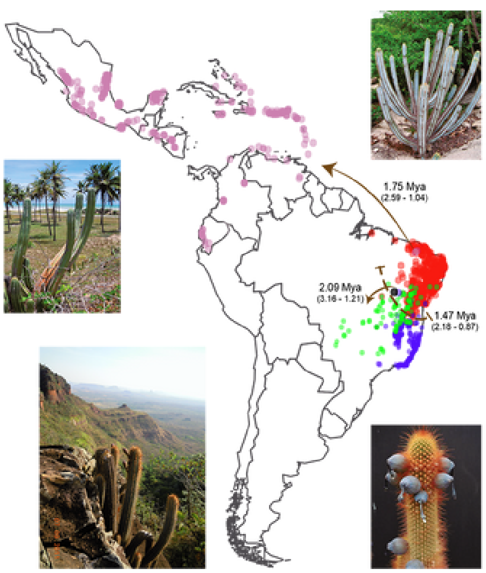
***Passiflora* (the passionflowers) is an extremely diverse genus of ~570 species, most of which are Neotropical climbers.** To date, only a few occurrences of fossil seeds and pollen can be concretely attributed to *Passiflora*. This limited fossil record poses problems for exploring the diversification and biogeography of passionflowers in deep time. **Hermsen describes a new species of passionflower, *Passiflora sulcatasperma,* on the basis of fossil seeds from the 4.9 to 4.5 million-year-old Gray Fossil Site, eastern Tennessee, USA.** The author compared *P. sulcatasperma* to modern *Passiflora* seeds with ridged-and-grooved seed coats and concluded that *P. sulcatasperma* is likely related to a group of passionflowers that are found mostly in the West Indies, Mexico, and Central America today. *Passiflora sulcatasperma* is only the third fossil seed species conclusively assigned to *Passiflora*. This species may follow a pattern of biogeographic connections between the floras of eastern North America and eastern Mexico and appears to have reached eastern North America from the south. **The author's interpretations provide important new insights into the evolution and biogeography of this genus.**

Early bloomers vs. late bloomers: Shifts in individual flowering time affect reproduction

Climate change is altering the phenology of many plant and animal species, particularly at high latitudes and elevations. Studies focused on plants have primarily measured population-level shifts in phenology, but individual-level shifts may affect pollination, reproduction, and population persistence. **To understand the impacts of individual variation in phenology, Schiffer et al. collected floral phenology and seed set data from three montane wildflower species with different seasonal flowering times.** The authors accelerated snowmelt to increase variability in phenology and measured conspecific pollen donor density and pollen limitation. The results show that individual shifts in phenology significantly change fecundity, but the effects are species-specific. For example, blooming late was advantageous for the early-season species, but detrimental for the late-season species. Limited pollinator visitation, rather than pollen donor density, likely drove changes in fecundity. **These data suggest that individual variation is important to consider when predicting the impacts of climate-induced phenological shifts on plant communities.**

Annie Schiffer et al. 2023. Differences in individual flowering time change pollen limitation and seed set in three montane wildflowers. *American Journal of Botany*. https://doi.org/10.1002/ajb2.16123

Refining the pattern of rapid Pleistocene radiation of a cactus genus across the Americas



Monique Romeiro-Brito et al. 2023. Revisiting phylogeny, systematics, and biogeography of a Pleistocene radiation. *American Journal of Botany* https://doi.org/10.1002/ajb2.16134

Understanding how past environmental changes shaped the current distribution and diversity of xerophytic plants helps to predict the consequences of global warming—and phylogenetic trees are powerful tools to infer such changes. However, insufficient genetic data and the mode of diversification of these plants (e.g., fast or slow) can hinder the ability to infer reliable trees. **Romeiro-Brito et al. integrated a multilocus genetic dataset and novel phylogenetic approaches to confidently assess the ancestral range and the effect of geography on the diversification of *Pilosocereus*, a cactus genus widely distributed in dry regions from Brazil to Mexico.** The authors inferred that this genus began diversifying during the Plio-Pleistocene transition (around 2.6 million years ago) in the Caatinga dry forests of northeastern Brazil and then experienced a sudden increase in speciation rates. The results suggest that multiple dispersal events from Caatinga accompanied this evolutionary radiation to other dry forests in South and North America. **Finally, the authors noted that the climatic oscillations during the Pleistocene may have triggered new ecological opportunities for species to extend their distribution range and increase their taxonomic diversity.**