

Highlighted Articles for September 2024

Plants that sequester extreme concentrations of nickel possess unique flower microbiomes

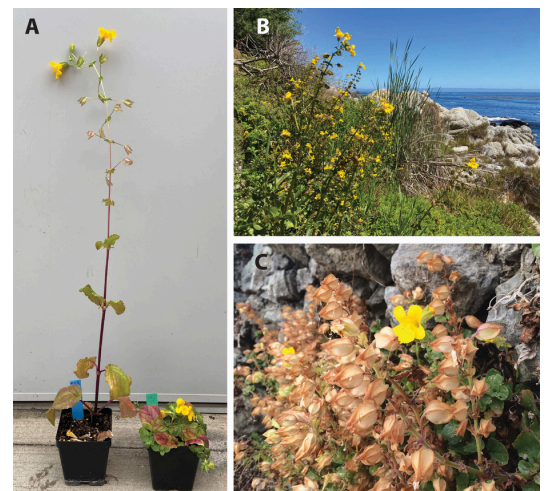


Nevin Cullen and Tia-Lynn Ashman. 2024. Hyperaccumulation of nickel but not selenium drives floral microbiome differentiation: A study with six species of Brassicaceae. *American Journal of Botany* <https://doi.org/10.1002/ajb2.16382>

In a novel study, Cullen and Ashman characterized bacterial and fungal communities (microbiome) living on flowers of a nickel-loving species of jewel flower (*Streptanthus polygaloides*) that sequesters nickel in its flowers and other tissues at levels that are toxic to most other plants. They found that flowers of the nickel-loving plant contained distinctive species of microbes compared to two of its non-metal associated relatives that grow in the same region. Notably, flowers of the nickel-loving plant did not contain the widespread floral bacteria that were present in the other two species. **The authors similarly compared flower microbiomes of the selenium-accumulating desert flower, *Stanleya pinnata*, to its close relatives but did not find microbiome distinctions between selenium-accumulating and non-accumulating species.** Taken together, these findings suggest that nickel acts as an “elemental-filter,” preventing certain microbes from associating with flowers. **This work contributes to the understanding of the elements that shape this hidden world of microbes that may influence flower-pollinator interactions.**

Yellow monkeyflower heights vary predictably with latitude and ocean exposure along the U.S. West Coast

Evolutionary biologists have long debated whether trait variation is distributed continuously or discontinuously among discrete groupings of populations, often referred to as ecotypes. These debates suggested the possibility that there are clines in traits within ecotypes. **Following previous observations of a possible cline within the coastal perennial ecotype of the yellow monkeyflower (*Mimulus guttatus*), Zambiasi and Lowry conducted a common garden experiment planted with seeds gathered from along the U.S. West Coast and investigated whether the plants’ morphological traits varied with latitude and exposure to the open ocean.** Overall, monkeyflower height was smaller in more northern populations. Populations exposed to the open ocean were also shorter than more protected populations. This result suggests that the combination of wind and oceanic salt spray is a selective force driving the stature of plants. **Most notably, this study highlights how plant trait variation can exist both as distinct ecotypes and as continuous variation within these groupings.**



Thomas Zambiasi and David Lowry. 2024. Ocean exposure and latitude drive multiple clines within the coastal perennial ecotype of the yellow monkeyflower, *Mimulus guttatus*. *American Journal of Botany* <https://doi.org/10.1002/ajb2.16402>

A forest from the southern polar circle: A witness to Earth's last prolonged hothouse climate

A study by Miriam Slodownik describes a fossil flora from Tasmania, Australia, that is remarkable in several respects. Dating back 53–50 million years, this plant assemblage flourished during the Early Eocene Climatic Optimum (EECO), a period of extreme global warmth. At this time, Tasmania was situated at the polar circle, and experienced (sub-)tropical-like warmth and seasonal variation in temperature and light. Tasmania was also still connected to Antarctica, before its eventual separation and Australia's northward drift into lower latitudes. **The author identified 12 species of non-flowering plants, and the flora includes a high conifer diversity, a cycad, a “seed” fern, and a climbing fern.** Striking similarities of the Tasmanian assemblage to contemporaneous Argentinian floras suggest that the southern polar biome of the EECO spanned from southern Australia across Antarctica to South America. Today, the closest living relatives of these Tasmanian fossils are predominantly found in the (sub-)tropical regions of South America and Australasia. **This study does not only give a comprehensive summary of the non-flowering plants within this assemblage but also provides insights into their broader spatiotemporal context and potential adaptations to the unique environmental conditions in the polar regions.**



Miriam A. Slodownik. 2024. The non-flowering plants of a near-polar forest in East Gondwana, Tasmania, Australia, during the Early Eocene Climatic Optimum. *American Journal of Botany* <https://doi.org/10.1002/ajb2.16398>

Fossil seeds connect Cleomaceae genera to the geological timeline



Theresa C. Saunders et al. 2024. Tangled webs and spider-flowers: Phylogenomics, biogeography, and seed morphology inform the evolutionary history of Cleomaceae. *American Journal of Botany* <https://doi.org/10.1002/ajb2.16399>

Cleomaceae is an important plant family in studies of genome evolution, floral form diversification, photosynthetic pathway evolution, and more. Despite its importance, many phylogenetic relationships within the family have been difficult to resolve. Worldwide distributions have made species difficult to sample, and a lack of definitive fossil records has limited attempts to estimate the age of the family. **Saunders et al. used targeted gene capture, seed shape and ornamentation, and seed fossil records to resolve evolutionary relationships in the family.** In one of the most comprehensive studies of Cleomaceae to date, their study identified confident generic relationships and suggested that the family originated in Africa and the Palearctic about 53 million years ago. Multiple trans-Atlantic disjunctions were also identified, with these disjunctions most likely being caused by either long-distance dispersals or contractions in latitudinal distributions caused by climate change over geological timescales. **Utilizing detailed imagery of extant seeds, the authors also found that seed morphology varied considerably across the family but mostly mirrored generic relationships, and modern-day seeds overlap significantly with fossil seeds in shape and size.**