Functional phylogenomics of the Caryophyllales: reticulate evolution, gene and genome duplication, biochemistry, and beyond

**Abstract:**

Modern transcriptomic and genomic techniques offer the ability to explore the patterns and drivers of plant diversification at a scale never before possible. Using a dataset of genomes and transcriptomes from over 300 species across the Caryophyllales we found evidence for at least 30 ancient genome duplication events. From this enormous dataset of >15,000 genes per species, we discovered that many gene duplication events were associated with key adaptive trait changes, such as evolution of betalain pigmentation. Our work integrates not only new molecular phylogenomic and computational methods, including several developed for this study, but also field- and collection-based research to connect niche shifts to their genetic and genomic bases.