

Solving Darwin's 'abominable mystery': How flowering plants conquered the world

January 11 2018



Credit: CC0 Public Domain

Scientists have found an explanation for how flowering plants became dominant so rapidly in ecosystems across the world—a problem that Charles Darwin called an 'abominable mystery'. In a study publishing on

January 11 in the open access journal *PLOS Biology*, Kevin Simonin and Adam Roddy, from San Francisco State University and Yale University respectively, found that flowering plants have small cells relative to other major plant groups and that this small cell size is made possible by a greatly reduced genome size.

For more than 200 years, scientists have speculated about the incredible diversity and success of [flowering plants](#), which form the basis of our food system and are responsible for fueling much of the animal diversity we see today.

Over the last thirty years researchers have shown that the flowering [plants](#) have unparalleled rates of photosynthesis. This has allowed them to grow faster and to outcompete ferns and conifers which had dominated ecosystems for hundreds of millions of years. The secret to the metabolic success of flowering plants is their specialized leaves that facilitate faster rates of water transport and carbon dioxide uptake. But how were the flowering plants able to build leaves capable of these high rates of transpiration and photosynthesis?

This new research provides a mechanism. By scouring the literature for data, the authors argue that these anatomical innovations are directly linked to the size of their genome.

Because each cell has to contain a copy of the plant's genome, smaller genomes allow cells to be smaller, and if cells are smaller then more cells (such as those specialized for photosynthetic metabolism and water and nutrient transport) can be packed into a given volume of space. Additionally, by shrinking the size of each cell, water and nutrient delivery can be made more efficient.

Comparing hundreds of species, the researchers found that [genome](#) downsizing began about 140 million years ago and coincided with the

spread of the earliest flowering plants around the world. "The flowering plants are the most important group of plants on earth, and now we finally know why they have been so successful," they say.

Although this research answers a major question, it opens the door to many more. Why were the flowering plants able to shrink their genomes more than other plant groups? What innovations in [genome structure](#) and packing have the flowering plants exploited? How have the ferns and conifers managed to elude extinction despite their large genomes and [cells](#)?

More information: Simonin KA, Roddy AB (2018) Genome downsizing, physiological novelty, and the global dominance of flowering plants. *PLoS Biol* 16(1): e2003706.
doi.org/10.1371/journal.pbio.2003706

Provided by Public Library of Science

Citation: Solving Darwin's 'abominable mystery': How flowering plants conquered the world (2018, January 11) retrieved 26 April 2024 from <https://phys.org/news/2018-01-darwin-abominable-mystery-conquered-world.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.