

A 'Big Bang' of plant evolution

by Bend_Weekly_News_Sources

Scientists are shedding light on what Charles Darwin called an "abominable mystery": how and when flowers evolved. In two papers to be published next week, researchers report that two of the largest groups of flowering plants are more closely related to each other - than any of the other major lineages are. These are the monocots, which include grasses and their relatives, and the eudicots, which include sunflowers and tomatoes.

New studies indicate the two largest groups of flowering plants are more closely related to each other than any of the other major lineages. These are the monocots, which include grasses and their relatives, and the eudicots, which include sunflowers (above) and tomatoes. (Photo courtesy U.S. Nat'l Park Service)

The scientists also found that a stunning diversification of flowering plants they call the "Big Bang" happened in the relatively short span of under five million years and led to all five major lineages of flowering plants alive. "Flowering plants today comprise around 400,000 species," said Pam Soltis, University of Florida, a member of one of the research teams. "So to think that the burst that give rise to almost all of these plants occurred in less than five million years is pretty amazing" especially when you consider that flowering plants as a group have been around for at least 130 million years. Robert Janzen, a biologist at the University of Texas at Austin and member of the second research group, said the two papers set the stage for all future comparative studies of flowering plants. The new work is to appear in the research journal *Proceedings of the National Academy of Sciences*. "If you are interested in understanding the evolution of flowering plants, you can't do that unless you understand their relationships," he said. Botanists predicted Darwin noticed that flowering plants, which comprise at least 60 percent of all green plant species, diversified abruptly shortly after they appeared. The details, and especially the cause, of this diversification "Darwin's 'abominable mystery'" have been a hot topic in botany ever since. The speed of the diversification is "one of the reasons why it's been hard to understand evolutionary relationships among the major groups of flowering plants," Janzen said. Researchers with the two universities analyzed DNA from plant chloroplasts, the cellular components responsible for plants' ability to convert sunlight into sugar. Janzen and colleagues at his university analyzed DNA sequences of 81 genes from chloroplasts of 64 plant species; University of Florida researchers analyzed 61 genes from 45 species. The two groups also performed a combined analysis. Through this process they gradually built a kind of family tree for plants, a diagram of relationships among lineages showing diversification over the eons. Based on known rates of genetic change checked against fossils of known ages, they established a time scale that showed estimated dates of major evolutionary branching events that produced new species. Previous research had found that flowering plants split into three branches shortly after appearing. That process was gradual, at least compared with the rapid radiation, or branching out, that followed. The details of that radiation have been murky. The latest studies clarify the picture by showing that all plants fall into five major lineages that developed over five million years or less, researchers said. The diversification "causes remains mysterious," said the University of Florida's Pam and Doug Soltis. It could have been spurred by some major climatic event, they said. It's also possible, they added, that a new evolutionary trait "a water-conducting cell that transfers water up plant stems" proved so effective that it triggered a flourishing of new species.

Courtesy University of Florida and World Science staff

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